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ABSTRACT

Obtaining accurate and reliable data on curriculum and instruction in two-year colleges poses many unique problems for institutional researchers. The methodologies presented here are those used by the Center for the Study of Community Colleges in a study of science instructional programs. The study included a curriculum component, a survey of instructional practices, and an intensive review of the literature. Methodologies were chosen or developed not only for their applicability within a two-year college context, but for their reliability and cost effectiveness. After obtaining a balanced national sample of 175 colleges, the catalogs and class schedules were inspected to develop a picture of the level of effort in the various science disciplines. A course classification system for sciences in two-year colleges was created specifically for the project. This provided an organizational structure for curriculum data collection and provided consistently applicable criteria for exclusion or inclusion of the various "science" offerings. A class section survey (85.5% response rate) was used to obtain data on instructional practices. Various search strategies were employed for the literature review. In addition to a complete description of the methodologies, the course classification system, survey instrument, and survey correspondence are all appended. (Author)

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METHODOLOGIES EMPLOYED IN A STUDY OF SCIENCE INSTRUCTIONAL PROGRAMS IN TWO-YEAR COLLEGES

Andrew Hill

Center for the Study of Community Colleges

1979

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ABSTRACT

Obtaining accurate and reliable data on curriculum and instruction in two-year colleges poses many unique problems for institutional researchers. The methodologies presented here are those used by the Center for the Study of Community Colleges (Los Angeles) in a study of science instructional programs. The study included a curriculum component, a survey of instructional practices, and an intensive review of the literature. Methodologies were chosen or developed not only for their applicability within a two-year college context, but for their reliability and cost effectiveness. After obtaining a balanced national sample of 175 colleges, the catalogs and class schedules were inspected to develop a picture of the level of effort in the various science disciplines. A course classification system for sciences in two-year colleges was created specifically for the project. This provided an organizational structure for curriculum data collection and provided consistently applicable criteria for exclusion or inclusion of the various "science" offerings. A class section survey (85.5% response rate) was used to obtain data on instructional practices. Various search strategies were employed for the literature review. In addition to a complete description of the methodologies, the course classification system, survey instrument, and survey correspondence are all appended.

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INTRODUCTION

Two-year community and junior colleges presently enroll more than four million students, one-third of all students in American higher education. Current figures show that forty percent of all first-time, full-time students are in two-year colleges. Add the people beginning college as part-time students, and those who attend the two-year college concurrently with or subsequent to their enrolling in a senior institution, and the number of first-year students taking two-year college courses approximates two-thirds of all freshmen.

These impressive figures have steadily increased in recent years as the growth rate of two-year colleges has progressed at a pace greater than that of senior institutions. This growth, however, has not been uniform. Public institutions in urban areas have expanded greatly, while many private colleges face shrinking enrollments and possible closure. The types of enrollments also demonstrate a lack of uniformity. Much of the growth in enrollments is in remedial education and in the business and occupational areas rather than in the traditional two-year transfer curriculum.

What can be said about the sciences in two-year colleges? Are they being compromised by remedial studies and occupational education or are they flourishing in new curricular patterns? Are they maintaining their traditional forms in college-transfer courses, or are they reforming in interdisciplinary combinations? What are the course goals, and the materials and methods in use? How much reading do science instructors require of their students? To what extent have past studies and conferences influenced and shaped the current science curriculum?

Under a grant from the National Science Foundation, the Center for the Study of Community Colleges conducted a study of curriculum and instruction in two-year college science and science-related technologies in an attempt to answer some of

those questions. Three separate but interrelated activities were undertaken: Development of a course classification system as a vehicle for categorizing courses in two-year college catalogs, sampling the colleges, and identifiying and tabulating science offerings on the schedules of classes (curriculum phase); a class section survey (instructional phase); and an intensive survey of the literature from 1963 to 1978.

Many research plans might have been devised and many methodologies implemented to establish a picture of science curriculum in two-year colleges in the United States. Ideally, to obtain a comprehensive map of the science programs, all previous studies would be reviewed and every course offered in every college would be examined for at least one academic year. For a complete picture of classes, instructional methods, course goals, materials used, and reading requirements, every one of the 30,000 or so instructors teaching in all disciplines under NSF purview would be surveyed. Obviously, however, tabulations of all courses in the universe of colleges and surveys of the total population of instructors are not feasible within a reasonable budget. Since some reduction in scale is necessary, sampling must be undertaken.

The design of this study was selected in order to provide a maximum amount of information about curriculum and instruction within a feasible work plan. This report will detail the methodologies employed in each of the major undertakings. Project findings are reported in twelve disciplinary-oriented monographs available through the ERIC system.

PART I

COURSE CLASSIFICATION SYSTEM

The first task in "A Study of Science Instructional Programs in Two-Year Colleges" was to develop a system to array the data and to determine which courses would be counted as "science" offerings. The charge was to describe all science and science-related technologies as they currently exist in the two-year college. In some of the traditional science disciplines this presented few problems, as virtually all chemistry, physics, mathematics, and biology clearly fell within the scope of our study. Conversely, courses were not included if they were exclusively or primarily concerned with clinical experience, business administration, finance, management, supervision, personal adjustment or improvement, the acquisiton of skills for a trade, cooperative work experience or independent study, regardless of content or level of the course. But in areas such as agriculture, natural resources, engineering, computer sciences, and the social and behavioral sciences, where cleavage points are often difficult to determine and consistently apply, the need to develop a usable set of criteria was clear.

In addition to the determination of inclusion or exclusion of a course or program, the data had to be arrayed in such a way that would facilitate project staff analysis and description of the science curriculum. A review of existing classification systems showed that no previously developed taxonomies were applicable. Accordingly, the Course Classification System for the Sciences (CCSS) in Two-Year Colleges was developed specifically for this project to deal with science courses in terms of both the unique features of the two-year colleges and the traditional scientific disciplines. The CCSS provides a means for generating comprehensive and complete information on a continuing basis, and will be presented here (see Appendix A) so that future studies that utilize the CCSS can

use the Center's baseline data with the assurance that the data are truly comparable.

The classification of courses is based primarily on the subject matter content of the individual course. Consideration is also given to the orientation to specific curricular areas, the level of mathematics and scientific background required and used in the course, and the length of time devoted to the course sequences.

The general structure of this sytem includes a three-level hierarchy of categories. The first level of classification was course curriculum area, and six major areas were identified:

Agriculture and Natural Resources

Biological Sciences

Engineering Sciences & Technologies

Mathematics and Computer Sciences

Physical Sciences

Social and Behavioral Sciences

These areas were chosen because they closely reflect the instructional administrative organization of two-year colleges as well as the organization of national and international professional science organizations and agencies, including the National Science Foundation.

The second level of classification was executed primarily by the major subject field disciplines within the broad area. Third level classifications were based upon a variety of discriminating factors that were usually determined by the curricular structure of the disciplines. The following charts capsulize the CCSS; a complete breakdown of the system is appended. It is important to note that courses are initially categorized by first level classification, and are then further broken into second level, and finally third level groups.

LEVEL 1	LEVEL 2	LEVEL 3
AGRICULTURE/ NATURAL RESOURCES		
	AGRICULTURE-GENERAL	
		Introduction/Orientation
		Pests and their control
		Agriculture engineering
	ANIMAL SCIENCE	
		Animal science
		Animal breeding
		Animal nutrition
		Animal health
		Animal husbandry
	PLANT SCIENCE	
		Plant science
		Agronomy
		Horticulture
		Ornamental horticulture
		Greenhouse
		Plant pathology
	SOIL SCIENCE	
		Soil Science
		Irrigation/Fertilization
		Soil mechanics
	FORESTRY	
		Introduction
		Forest sciences
		Forest technology
		Forest products
	WILDLANDS AND WILDLIFE	
		Fisheries
		Wildlife
		Range
		Wild land
		Water

LEVEL 1	LEVEL 2	LEVEL 3
BIOLOGICAL SCIENCES		
	BIOLOGY-INTRODUCTION	
		Non-science majors
		Occupational services
		Science majors
		Specialized (non-majors)
	BIOLOGY-ADVANCED	
		Molecular/Cellular
		Genetics
		Embryology
		Microtechniques
		Population/Evolution
	BOTANY	
		Non-science majors
		Occupational services
		Science majors
		Field botany
	ZOOLOGY	
		Non-science majors
		Occupational services
		Science majors
		Animal anatomy/Physiology
		Ornithology
	HUMAN BIOLOGY	
		Human biology
		Anatomy & physiology/General
		Anatomy & physiology/Allied Health sciences
		Specialized anatomy & physiology
		Medical
		Dental
	MICROBIOLOGY	
		Microbiology
		Bacteriology
		Microbiology for special groups
	ENTOMOLOGY	
		Entomology
		Entomology for special groups

LEVEL 1	LEVEL 2	LEVEL 3
BIOLOGICAL SCIENCES		
(continued)	ECOLOGY AND ENVIRONMENTAL	
		Non-science majors
		Science majors
		Field and nature
		Marine
	RELATED TOPICS	
		Nutrition
		Pharmacology
		Radiation effects
		Teaching methods

LEVEL 1	LEVEL 2	LEVEL 3
ENGINEERING SCIENCES AND TECHNOLOGIES		
	ENGINEERING-GENERAL	
		Introduction Engineering problems
	ENGINEERING GRAPHICS AND DESIGN	
		Engineering drawing & drafting Engineering graphics Descriptive geometry Design Electrical & electronic drafting Other graphics
	CIVIL ENGINEERING	
		Introduction to surveying General surveying Specialized & advanced surveying
	ELECTRICAL/ELECTRONIC TECHNOLOGY	
		Introductory electrical theory Electrical technology Electrical circuits Introductory electronics (service) Introductory electronics (tech.) Advanced circuits Specialized electronics Industrial electronics Other
	MATERIALS	
		Properties and uses Testing Processes and materials Metals-metallurgy
	MECHANICAL ENGINEERING	
		General mechanics Statics, strength of materials, structural design Dynamics, kinematics, mechanisms, machine design Fluids, hydraulics, & pneumatics Thermodynamics Electromechanical systems Statics and dynamics Other

LEVEL 1	LEVEL 2	LEVEL 3
ENGINEERING SCIENCES AND TECHNOLOGIES (continued)	INDUSTRIAL ENGINEERING TECHNOLOGY	
		Introduction
		Manufacturing materials & process
		Quality control
		Metrology and metrics
		Work achievement
		Industrial safety
	AERONAUTICAL, AUTOMOTIVE, & COMBUSTION ENGINEERING	
		Aeronautical engineering
		Automotive engineering
		Combustion engineering
	OTHER ENGINEERING AND TECHNOLOGY FIELDS	
		Mining engineering & tech.
		Nuclear engineering & tech.
		Optical engineering & tech.
		Petroleum engineering & tech.
		Solar engineering & tech.

LEVEL 1	LEVEL 2	LEVEL 3
MATHEMATICS AND COMPUTER SCIENCES		
	INTRODUCTORY AND INTERMEDIATE	
		Pre-algebra
		Introductory algebra
		Geometry
		Intermediate algebra & trig.
		College algebra & trig. (pre-calculus)
	ADVANCED MATHEMATICS	
		Analytic geometry
		First year calculus
		Second year calculus
		Advanced topics
		Linear algebra
	APPLIED MATHEMATICS-TECHNOLOGY RELATED	
		Pre-algebra
		Algebra thru trigonometry
		Calculus
	MATHEMATICS FOR OTHER MAJORS	
		Non-calculus--liberal arts/ Education/Social sciences
		Non-calculus--business
		Non-calculus--biological sci./ Allied health/Agriculture
		Calculus
	STATISTICS AND PROBABILITY	
		Introduction
		Business statistics
		Statistics for technological fields
		Advanced statistics
	COMPUTER SCIENCE AND TECHNOLOGY	
		Computers for non-science majors
		Computer programming
		Math for computers
		Technical aspects of computers
		Calculators and slide rules

LEVEL 1	LEVEL 2	LEVEL 3
PHYSICAL SCIENCES		
	CHEMISTRY-INTRODUCTORY	
		Non-science and non-tech. students
		Allied health and other biology-related occupations
		Engineering technology
		Preparatory chemistry
		General chem. for sci. and eng.
		Intro. for chem. tech.
		Other introductory chemistry
	CHEMISTRY-ADVANCED	
		Analytical, including instrumental methods
		Organic, incl. biochemistry
		Industrial & chemical engineering
		Clinical
		Other
	GEOGRAPHY	
		Introductory and general
		World and regional
		Physical
		Cultural
		Economic and political
		Environmental
		Cartography, photogrammetry
		Other
	GEOLOGY	
		Introductory and general
		Regional and field
		Physical
		Historical
		Mineralogy
		Paleontology
		Environmental
		Geomorphology
		Other
	OTHER EARTH AND SPACE	
		Interdisciplinary
		Astronomy
		Meteorology and climatology
		Oceanography and limnology

LEVEL 1	LEVEL 2	LEVEL 3
PHYSICAL SCIENCES (continued)	PHYSICS	
		Non-science & non-tech. students
		Allied health and biology-related
		Engineering technology
		Preparatory
		General physics (non-calculus)
		Other non-calculus physics
		Engineering and general physics (calculus based)
	INTEGRATED SCIENCES	
		Non-science majors
		Physical science survey
		Science for allied health students
		Science for engin. and industry-related technology
		Measurement and metrics
		Science teaching methods
		Forensic science
		Preparatory and special courses for science majors
		Other general science
	ENVIRONMENTAL SCIENCE	
		Non-science and non-tech.
		Environmental technology
		Air pollution
		Water pollution
		Noise pollution
		Solid waste disposal
		Nuclear radiation control
		Agriculture pollution
		Other environmental studies

LEVEL 1	LEVEL 2	LEVEL 3
SOCIAL AND BEHAVIORAL SCIENCES		
	ANTHROPOLOGY	
		Introductory-general
		Physical
		Cultural
		Archaeology/Prehistory
		Indian and Native American
		Specialized cultural
		Other
	PSYCHOLOGY	
		Introductory
		General
		Developmental
		Abnormal
		Social/Industrial
		Personality/Adjustment
		Experimental
		Educational
		Contemporary issues
		Physiological
	SOCIOLOGY	
		Introductory
		General
		Social problems--general
		Marriage and family
		Social institutions
		Social problems--specific
		Social institutions--specific
		Sociology of groups
		Other
	ECONOMICS	
		Introductory
		Principles
		Business-related
		Technology-related
		American history and economy
		Other

LEVEL 1	LEVEL 2	LEVEL 3
SOCIAL AND BEHAVIORAL SCIENCES		
	INTERDISCIPLINARY	
		Social science
		Environmental
		Aging
		Special groups
		Social research
		Thanatology
		Urban planning
		Other

Use of the CCSS on a nationwide level, or at the single campus level, results in a "topographical" map of the curriculum. It is thus possible to identify and report quantitatively the "elevation" (level of effort) for each component of the science curriculum.

PART II

SAMPLE COLLEGES

In order to accurately and economically describe science instructional programs in over 1200 two-year colleges, a representative subset of the universe must be drawn. Since two-year colleges include private, liberal arts related institutions of fewer than 200 students; new, public, occupational, and technical institutes; multicampus, comprehensive colleges with over 30,000 students; colleges in rural areas drawing from 100 miles around; inner-city colleges without campuses; and numerous other types, accurate data can be obtained only if a broad sample of colleges is utilized.

The sample of 178 colleges that was used in the Center for the Study of Community Colleges' "Analysis of Humanities Education" was used as the starting point in generating a representative sample for this study. Briefly, this sample group was drawn as follows.

The original sample was drawn in 1975 for a study of two-year college humanities faculty. Beginning at a random number, every fifth private college name was drawn from the 1975 Community, Junior, and Technical College Directory published by the American Association of Community and Junior Colleges. This yielded the names of 42 of the 209 independent junior colleges listed. The same procedure was followed for public colleges, yielding the names of 193 of the 968 publicly supported institutions. Since the colleges are listed in the Directory by state, the list of colleges was balanced regionally. The president of each college was invited to participate in the study, and 156 presidents acquiesced.

The Center continued its study of humanities education with another survey in 1977. To allow colleges opened since 1975 a chance to be included in the sample and to increase the sample size, every twentieth private and public college

name was drawn from the 1977 Directory. This yielded an additional sixty colleges, all of which were invited to participate in the study, along with the 156 original colleges. One hundred thirty-six (136) of the original sample chose to continue, along with 42 of the new invitees, yielding a sample of 178 colleges.

These 178 colleges that were participants in the Center's 1977 humanities study formed the nucleus of the sample for "A Study of Science Instructional Programs in Two-Year Colleges." As the science project was commencing at the same time that the humanities survey was concluded, a letter sent to the president of each of the 178 colleges invited their participation in the science project (letters included in Appendix B). Of the 178 colleges that participated in the humanities study, 157 agreed to continue participating in the science study.

At this point it was clear that our sample would fall short of the target sample of 180 colleges, so it became necessary to solicit new schools to join the study. To balance the sample we matched the percentage breakdowns by region and college size of the 157 colleges that had agreed to take part in the science study against the universe of two-year colleges in the 1977 Directory. By placing the participating colleges in a size/region matrix, it was determined which cells were below the norm. Colleges were grouped into nine size categories (ranging from less than 500 students to more than 15,000 students) in six geographic regions (for region and size categories, see Appendix C), creating a nine by six matrix with a total of 54 cells. All the colleges in the Directory that belonged in the underrepresented cells were arrayed and then randomly selected. Because 23 more colleges were needed to complete a 180 college sample, 46 new colleges were invited, as we anticipated a 50% rate of response (invitation letter in Appendix B). Since 18 of the 46 colleges (39.1%) agreed to participate, our sample was closed at 175 colleges.

The sampling techniques employed produced a sample balanced by region, size

and control. The following tables are indicative of the representativeness of this sample of 175 colleges.

TABLE 1

PERCENTAGE BREAKDOWN OF 175 COLLEGE SAMPLE COMPARED TO NATIONAL PERCENTAGES BY COLLEGE SIZE

SIZE	1-499	500-999	1,000-1,499	1,500-2,499	2,500-4,999	5,000-7,499	7,500-9,999	10,000-14,999	15,000+
NATIONAL %	15	18	13	17	17	8	5	5	4
SAMPLE	13	16	13	17	19	9	5	6	4

TABLE 2

PERCENTAGE BREAKDOWN OF 175 COLLEGE SAMPLE COMPARED TO NATIONAL PERCENTAGES BY COLLEGE REGION

REGION	Northeast	Middle States	South	Mid-West	Mountain Plains	West
NATIONAL %	7	13	32	21	10	17
SAMPLE	6	12	31	22	13	16

TABLE 3

PERCENTAGE BREAKDOWN OF 175 COLLEGE SAMPLE COMPARED TO NATIONAL PERCENTAGES BY COLLEGE CONTROL

CONTROL	PUBLIC	PRIVATE
NATIONAL %	84	16
SAMPLE	84	16

PART III

CURRICULUM STUDY

The first two sections have detailed the Course Classification System for the Sciences (CCSS) and explained the procedures utilized in drawing our sample of colleges. The 175 colleges in the sample were required to forward us a copy of the 1977-78 academic year catalog, day and evening schedules of classes, and the name of a contact person to act as the on-campus facilitator.

The college catalogs were the first item considered in the study of curriculum. Utilizing the CCSS, each course in all 175 catalogs was individually reviewed to determine scientific content and appropriate first, second, and third level classification.

Tally sheets were prepared for all the colleges which listed every science course listed in the catalog (see sample first level classification sheet, Appendix D). For each of the 175 colleges, separate tally sheets were prepared for each of the six first level classifications (agriculture and natural resources, biological sciences, engineering sciences and technologies, mathematics and computer sciences, physical sciences, and social and behavioral sciences). Although the classification sheets organized courses by first level classification, each course was individually listed at the third level of classification.

With these first level classification sheets as a guide, class schedules were closely examined one section at a time. Every science section was counted, and the number of sections offered of each science course was tallied for the regular school terms of the 1977-78 academic year (excluding summer and interterm sessions). Each step in the listing and tallying procedure was double-checked for accuracy.

Catalogs were consulted to determine instructional mode, prerequisites,

units, and class hours. When schedules and catalogs did not agree as to units, hours, etc., the schedule was considered to be the most up-to-date source.

After coding and listing all courses in the catalog, and counting the sections for the 1977-78 academic year, a picture of the overall science curriculum in the two-year colleges was developed. It was also possible to look at the individual disciplines in depth to determine curriculum patterns. The data were arrayed in such a way that variables such as college size, region, and control could be cross-tabulated with the disciplines to sharpen the focus on trends in the various science fields.

PART IV

INSTRUCTOR SURVEY

The curriculum study yielded information on the science programs. But to find out what the science faculty see as course goals, the type of material in use, and instructional patterns, it was necessary to directly question a sample of the faculty, as this information is not available in consistent form in any of the colleges' written documents.

Because faculty rosters tend to be incomplete, and rarely include the part-time faculty, a sampling plan that would query a truly random sample of the instructors was essential to assure that one could draw generalizations based upon their responses. To insure an accurately proportionate (based upon the number of sections taught) opportunity for each instructor to receive a survey, the class section was used as the sampling unit. Classes for the Fall, 1977, term in the 175 sample colleges were used as the basis for the survey.

As described in Part I, each science course was classified from the catalog description, recorded in groups by the six first level classifications, and the number of class sections for each course were counted and recorded. Therefore, for the Fall, 1977, term, we had a complete list of not only which science courses were offered, but how many sections of each course were listed on the schedule.

Based on projections of the desired sample size and the total number of sections offered, it was decided to sample every thirteenth science section offered during Fall, 1977. A randomly arrayed list of the 175 colleges was drawn. The number of sections offered at each college in the six major classifications was recorded on the list of randomly arrayed colleges (class section listing sheet). Starting with random numbers for the first college, an automatically self-randomizing system for section selection was utilized. To illustrate the

system used, the following page contains a class section listing sheet and the first level classification sheet for the social and behavioral science courses at Villa Julie College (Maryland). Note that under this classification (coded "60") Villa Julie offered eight class sections. Sections in this classification left over from the previous school totalled less than thirteen and yielded a random running total of eight (see "slop" number category on class section listing sheet).

SCHOOL P 11		10	20	30	40	50	60	TOT.
FLORIDA COLLEGE	Slop #	8	5	3	0	6	3	
	Total Sections	0	3	1	12	6	5	27
	Sections to Drop	—	—	—	—	—	—	0
	Slop #	8	8	4	12	12	8	X
VILLA JULIE	Total Sections	0	6	0	2	2	(8)	18
	Sections to Drop	—	5	—	1	1	(5)	4
	Slop #	8	1	4	1	1	(3)	X
INDIAN HILLS	Total Sections	0	4	1				
	Sections to Drop	—	—	—				
	Slop #	8	5					
MT HOOD	Total Sections	17	31	2				
	Sections to Drop	5	8,21	9				
	Slop #	12	10	1				
ARAPAHOE	Total Sections	3	19	2				
	Sections to Drop	1	3,16	2,15				
	Slop #	2	3	1				
BUNKER HILL	Total Sections	0	13					
	Sections to Drop	—	10	—				
	Slop #	2	3	1				

TO P. 12 GREEN RIVER

CLASS SECTION LISTING SHEET

College No. 206	Yr 8	Tr 2	Pg 1	VILLA JULIE Course Code	No. Sec	S 77 Lec	S 77 Lab	F 77 Lec	F 77 Lab
Dept	Course Number			60					
1. ECON	101			64 2				2	
2.	102			64				1	
3. EDUCATION	213			62 3				1	
4. INTERDIS	201			68 3					
5. PSYCH	101			62 2				2	
6.	107			62 3					
7.	110			62 4					
8.	112			62 6					
9.	120			62 6					
10. SOC	101			63 2				1	
11.	102			63 3					
12.	203			63 6					
13.	206			63 8				1	

FIRST LEVEL CLASSIFICATION SHEET

Hence, to draw the thirteenth section, we had to select the fifth social and behavioral science section at Villa Julie. Looking at the first level classification sheet, it was found that this would be the first section of Psychology 101 to appear on the schedule. The instructor of this class section was included in our sample. Because Villa Julie offered three more sections in this classification, these were "rolled into" the next school, thereby randomizing the selection process.

A complete description of the development and methods of the survey procedure used in the Center's studies is described in depth by Arthur M. Cohen in "Maximizing Responses to a Nationwide Faculty Survey" (1976, ED 122 912). For the science study, the procedure was conducted between February and June, 1978, after the completion of the Fall, 1977, term.

After pulling every thirteenth science section, a checklist for each on-campus facilitator listing targeted faculty was prepared. The checklist included the name of the instructor teaching the course (where no instructor was listed, the on-campus facilitator was asked to find out who taught the section listed), the course title, section number, and the days and time the class met. A copy of the checklist was kept at the Center to tally the surveys as they were received.

A packet containing the surveys (Appendix E), checklist, and complete instructions (Appendix B) was sent to each campus facilitator. Along with the survey and instructions, each instructor received a return envelope marked "Confidential." This was addressed to the facilitator, with the instructor's name listed as the return address. This enabled the on-campus facilitator to keep an exact record of which instructors had responded to the survey without examining the forms, thereby enabling the facilitator to follow up on the retrieval of surveys from non-respondents while guaranteeing response confidentiality to survey respondents. The first package of surveys was sent out on February 17,

1978, and the final package was sent out on April 10, 1978. A return postcard verifying receipt of the survey packets was included so that we knew the package had arrived at the campus.

Extra precautions were taken when large packets of surveys were mailed out. Within two weeks after a package containing more than twenty surveys was sent out, the Center contacted the facilitator by telephone. The need for this extra precautionary procedure is evidenced by the fact that 23 large colleges (13.1% of the sample) received 752 surveys (44.7% of the total number sent). Hence the chances of generating a sizable response rate was inextricably tied to the diligence of the facilitators at these 23 colleges, and difficulties in survey retrieval are often proportionate with school size. Fortunately, all these facilitators were highly competent and professional.

When the facilitators sent the surveys back, Center staff recorded which surveys had been returned. If 100% of the mailed surveys were completed or accounted for (non-deliverable surveys or surveys of cancelled sections were "accounted for"), a letter of thanks was sent to the facilitator. When surveys were unaccounted for, a list of delinquent surveys and new blank survey forms were mailed to the facilitator. At no time did we contact the instructors directly--all communication was conducted through the on-campus facilitator.

A total of 1683 surveys were mailed. When the survey procedures were closed down, there were 77 cancelled sections, 114 non-deliverable (due to death, termination, illness, etc.), and 1275 completed surveys were returned (85.5% of the deliverable surveys). The response showed a high correlation between the disciplinary associations of the respondents and the disciplinary breakdown of the total number of science sections. The table on the next page details this correlation (r=.994).

TABLE 4

CORRELATION BETWEEN DISCIPLINARY AFFILIATION OF SURVEY RESPONDENTS AND PERCENT OF TOTAL SCIENCE CURRICULUM BY DISCIPLINE

DISCIPLINE	Returns on the Class Section Survey--% of Total (n=1275)	1977-78 Academic Year % of Total Lecture Sections (n=49,275)
Math/Comp Science	30.8	32.5
Biology	12.5	10.5
Engineering	11.3	11.0
Pscyhology	11.2	11.6
Sociology	7.4	8.1
Chemistry	6.4	5.1
Economics	5.4	5.6
Earth/Space	3.6	3.6
Physics	3.5	3.2
Agriculture	3.0	3.0
Anthro/Inter. Soc Sci	2.4	3.0
Inter. Nat. Sci	2.3	2.7

The survey forms were cleaned, coded, and keypunched by Field Research Corporation (San Francisco). Computer print-outs were generated, with data cross-tabulated by discipline, full-time/part-time faculty status, doctorate/non-doctorate faculty, college control, college size, and college location.

PART V

LITERATURE REVIEW

A comprehensive review of the two-year college related science literature was conducted to assess past findings and recommendations in the various science disciplines. The review concentrated on the years 1963 through 1978. An initial search of the literature in the appropriate areas was conducted by the ERIC Clearinghouse for Junior Colleges (ERIC-JC) and ERIC Science, Mathematics, and Environmental Education Analysis Center (ERIC-SMEAC) with both clearinghouses searching their own files for pertinent documents.

A separate manual search was undertaken to uncover doctoral dissertations dealing with curriculum and instruction in the sciences. Particular attention was directed towards finding dissertations that dealt with these issues on a statewide or national level, but most of the dissertation materials were highly localized.

Extensive manual searches of the University of California at Los Angeles libraries were also undertaken, in particular the collections in the Education and Psychology Library and the University Research Library. When these collections had limited resources (e.g., in agriculture/natural resources) other libraries in Southern California were consulted.

Because of the recent advances in information retrieval, the numerous scientific and educationally oriented data bases were searched by computer. Not only was this the most thorough method, but it also was highly cost efficient. The following data bases were computer searched for information on two-year colleges: ERIC (Resources in Education, Current Index to Journals in Education), AGRICOLA (Bibliography of Agriculture, National Agricultural Library Catalog), BIOSIS (Biological Abstracts, Bioresearch Index), CA-CONDENSATES (Chemical

Abstracts), NTIS (U.S. Government Reports Announcements), PSYCH. ABS (Psychological Abstracts), and SOC. ABS (Sociological Abstracts).

Further documents were solicited from disciplinary associations, research organizations, and individuals around the country. Approximately one hundred associations and organizations were written (Appendix F) in an attempt to get as many unpublished documents as possible.

Utilization of a wide-range of search strategies, including manual, computerized, and direct solication, produced a comprehensive set of pertinent literature.

PART VI

SUMMARY

The methodologies employed in this study were devised to produce the maximum amount of reliable data on science instructional programs in two-year colleges within a reasonable budget. A major consideration was that the methods employed were suitable for gathering accurate information within the unique curricular and administrative patterns in community/junior colleges.

Prior attempts to quantify science curricular data have taken many different approaches. Insofar as an extensive search of past studies revealed few systems designed specifically to chart two-year college offerings, the Course Classification System for the Sciences (CCSS) was developed to classify and organize the science offerings. Rather than try to impose an existing classification system that would necessitate numerous capricious judgments of the scientific merit of a course or program, the CCSS was developed after an intensive examination of two-year college catalogs and schedules. Hence, the system is tailored to the reality of the two-year college programs, rather than trying to fit the courses into an existing, albeit inappropriate, system of classifying courses.

Randomization in selection yielded a balanced national sample of two-year colleges. The 175 colleges proportionally represent the universe of two-year colleges in virtually every respect. This allows the data to be analyzed not only on the national level, but by region, by college size, control, emphasis, and tuition rate.

The laborious effort of counting courses from class schedules was determined to be the only way to asses the science programs. Catalogs present information about a curriculum plan, but course schedules reveal the curriculum as it actually exists. In all, the Center staff counted nearly 50,000 science sections for the 1977-78 academic year.

The problems inherent in sampling instructors are myriad. Through the use of an on-campus facilitator, we were able to retrieve 85.5% of the deliverable surveys (1275 retrieved), and therefore feel quite confident that the data gathered from these responses is highly reliable. Realizing that it is impossible to get accurate faculty rosters (particularly of part-time faculty), the instructors sampled were randomly drawn from the class schedules, thereby giving the instructor of each science class section at all 175 colleges the same chance of receiving a survey form.

The final task undertaken was a comprehensive review of the literature. Because the two-year college literature is so irregularly dispersed amongst journals, books, and unpublished manuscripts, a variety of search strategies were employed. Besides engaging the staffs at the ERIC Clearinghouse for Junior Colleges and the ERIC Science, Mathematics, and Environmental Education Analysis Center to search their files for pertinent documents, extensive manual and computer searches were employed. A direct solicitation for materials from professional organizations and disciplinary associations was also undertaken.

In short, the methodologies employed in this study were chosen because of their appropriateness, cost-efficiency, and thoroughness. Conducting research in the two-year college setting presents many unique problems. The presentation of these methodologies will suggest ways in which the institutional researcher can generate accurate data within a framework designed specifically for the two-year college.

APPENDIX A

THE COURSE CLASSIFICATION SYSTEM FOR THE SCIENCES (CCSS)

COURSE CLASSIFICATION SYSTEM FOR THE SCIENCES

SIX MAJOR CURRICULUM AREAS

10	AGRICULTURE AND NATURAL RESOURCES AND RELATED TECHNOLOGIES
20	BIOLOGICAL SCIENCES
30	ENGINEERING SCIENCES AND RELATED TECHNOLOGIES
40	MATHEMATICS AND COMPUTER SCIENCES
50	PHYSICAL SCIENCES
60	SOCIAL AND BEHAVIORAL SCIENCES

10 AGRICULTURE AND NATURAL RESOURCES AND RELATED TECHNOLOGIES

Includes courses and programs having to do with the development, care, production, and management of food, natural fiber, animal, plant, forest and wildlife resources. More detailed descriptions and analyses can be found in the further breakdown in each of the following classifications:

11 - Agriculture - General

12 - Animal Science

13 - Plant Science

14 - Soil Science

15 - Natural Resources - General

16 - Forestry

17 - Wildlife and Wild lands

18 - Food Science

11 AGRICULTURE - GENERAL

The courses included in this category are introductory general education courses to orient the general student to the scope of the agriculture industry as well as introductory core program courses for agriculture majors. The topics covered include agriculture principles, and industry, physiological and biological factors, pest control, and engineering principles for farm mechanization.

11-1 Introduction/Orientation

11-2 Pests and Their Control

11-3 Agriculture Engineering

11-1 INTRODUCTION/ORIENTATION

These courses explore concepts in modern agriculture and cover a wide range of topics - primarily, the interrelationships between plants, sods, animals, and how they apply to the agriculture industry. Courses are intended for all students and satisfy general education requirements.

11-2 PESTS AND THEIR CONTROL

These courses are designed to introduce the agriculture major to the identification and chemical control of principal plant pests and weeds. Entomology, pesticide formulation, application methods, proper selection and use and safety of herbicides and insecticides are covered.

11-3 AGRICULTURE ENGINEERING

These courses are an introduction to agricultural engineering and cover the topics of farm power, machinery, electrification, and farm structures. Courses are intended primarily for vocational students in agriculture technology programs. Construction materials, equipment maintenance and operation are excluded.

12 ANIMAL SCIENCE

This category includes courses that survey principals of production, management, and marketing of livestock as well as an introduction to goals and objectives of an animal science program. The category breaks down further to include courses dealing with specialized topics of animal production - primarily breeding, nutrition, health and husbandry. The animal science courses are designed for students intending to complete programs in farm management and other animal industry-related technologies. Courses dealing specifically with equipment, animal maintenance and care are excluded.

12-1 Animal Science

12-2 Animal Breeding

12-3 Animal Nutrition

12-4 Animal Health

12-5 Animal Husbandry

12-1 ANIMAL SCIENCE

This topic is comprised of courses that are generally a program orientation and introduction to the industry for farm management students. Specifically, the courses cover characteristics of major livestock breeds, breeding practices, nutrition, management, and marketing. In most cases these courses are prerequisites for more advanced and specific issues covered in the following sub-categories.

12-2 ANIMAL BREEDING

These courses discuss the theory and practice of artificial insemination of farm animals. The courses include physiology of reproduction, genetics, selection, crossbreeding, inbreeding, specimen collection, storage, and shipment. Most courses include practical field experience in artificial insemination technique and in some cases fill requirements for certification. The courses are required for farm management and other animal industry related program completion.

12-3 ANIMAL NUTRITION

Included here are discussions of digestion, absorption, metabolism of nutrients as related to growth and reproduction of ruminant and monogastric animals, livestock nutrient requirements, feed composition, feeding standards, and

ration formulation. The course is a core program requirement for students majoring in farm management or other animal industry-related programs.

12-4 ANIMAL HEALTH

This topic includes treatment of health problems in the major livestock breeds associated with major physiological systems, interrelated metabolic disorders, and parasites. Fundamentals of immunity, disease symptomology, and examination are presented through a preventative health model. These courses are intended for students majoring in farm management or other animal industry-related programs.

12-5 ANIMAL HUSBANDRY

This category breaks down into general survey courses covering principals of livestock management, breeding, nutrition, and marketing, as well as more specialized courses applying these issues to cows, swine, sheep, poultry, horses, and dairy animals. These courses are intended for students in farm management and other animal industry-related programs.

13 PLANT SCIENCE

Plant science covers a wide range of crop and horticultural topics and emphasizes theory and technique through practical experience. The basic areas covered are plant production, field crops, horticultural practices, greenhouse management, and plant disease. In general, courses are intended for crop and horticultural science majors, but courses are also included for the general student. Courses in landscaping, floral design, equipment maintenance and operation are excluded.

13-1 Plant Science

13-2 Agronomy

13-3 Horticulture

13-4 Ornamental horticulture

13-5 Greenhouse

13-9 Plant Pathology

13-1 PLANT SCIENCE

These courses are basic plant science courses intended to introduce students to the fields of crop and horticultural science. They cover the topics of plant identification, weeds, seeds, basic terminology, physiology, and plant propagation techniques. Most courses are required for completion of crop and horticultural science programs and serve as pre-requisites for the more specialized sub-categories that follow.

13-2 AGRONOMY

Courses in this category examine representative field crops and related economic/environmental factors. Special emphasis is given to cereal, grain, and forage crops. Topics focus on growth, disease, harvesting practices, fertilization, storage, and land management and renovation. These courses are designed to fulfill crop and horticultural science program requirements.

13-3 HORTICULTURE-VEGETABLE AND FRUIT CROPS

Included here are courses intended as non-major electives for all students and more specialized practical courses for horticultural science majors. Courses designed for non-majors focus on home vegetable gardening and an overview of horticultural science. Courses for horticultural science

students focus on theory and appreciation of techniques in plant propagation, soil treatments, fertilization, and identification as they relate to commercial production of major fruit and vegetable crops.

13-4 ORNAMENTAL HORTICULTURE

These courses introduce horticulture students to nursery practices, production, care and maintenance of ornamental plants. Flowers, trees, shrubs, and turf grass are studied in terms of structure, growth, water, soil, light, temperature, pruning, disease, and pests.

13-5 GREENHOUSE MANAGEMENT

Types of plants grown in the greenhouse and how growth is accomplished under glass are major concepts covered in these courses. Management, light, heat, humidity and potting, transplanting, and fertilizing are considered. These courses vary in depth and can be taken by horticultural science majors or as an elective by non-majors.

13-9 PLANT PATHOLOGY

These courses introduce the crop and horticultural science students to common plant diseases caused by virus, fungi, and environmental factors. The courses emphasize identification, cause, and control.

14 SOIL SCIENCE

Soil science courses appear as program requirements in the areas of agriculture, engineering, forestry and horticulture. The three classifications focus on primary issues of soil science, irrigation/fertilization and soil mechanics. Soil science surveys chemical, physical, and biological properties of soils. Advanced treatment of maintenance and management techniques is covered in irrigation/fertilization and in soil mechanics.

14-1 Soil Science

14-2 Irrigation/Fertilization

14-3 Soil Mechanics

14-1 SOIL SCIENCE

Soil science courses introduce students to basic chemical, biological, and physical properties of soil. These courses are designed to cover soil topics related to the fields of agriculture, engineering, forestry including soil as life support medium for plants, conservation, management, strength and bearing capacity. The major topics of soil science are covered in greater depth in 14-2 and 14-3.

14-2 IRRIGATION AND FERTILIZATION

Principles of irrigation, application methods and systems, drainage, and plant requirements are considered with relationship to soil fertility. Additional topics covered are chemical nutrition, types of fertilizers, determination of nutrient functions, deficiency and toxic symptoms of nutrients. These courses are intended for agronomy, forestry, and engineering students.

14-3 SOIL MECHANICS

These courses appear in agriculture, construction engineering and forestry technology programs. Central focus is on types and classification of soils, as well as laboratory/field testing and sampling techniques.

15 NATURAL RESOURCES

These courses are intended for all students as an introduction to the history of environmental conservation in the United States. Conservation is studied in the areas of soil, water, wild life, forests, ranges, and atmosphere. Implementation through government programs is also studied with an emphasis on the future of U.S. natural resources.

16 FORESTRY

The courses in this classification cover the major aspects of forest technology. Introductory courses survey the industry and orient students to the forestry program. Forest sciences, technology methods, and forest products are dealt with in each of the sub-categories. Topics not included in this classification are fire fighting, equipment used in forestry and related technologies, and recreation principles.

16-1 Introduction

16-2 Forest Sciences

16-3 Forest Technology

16-4 Forest Products

16-1 INTRODUCTION TO FORESTRY

Courses in this category are an orientation to forestry in the United States. They introduce forestry students to skills and products related to the industry. This course is often a prerequisite for more advanced topics dealt with in 16-2, 16-3 and 16-4.

16-2 FOREST SCIENCES

These courses cover silvics, silviculture, dendrology, reforestation methods, and ecological concepts. They are designed for forestry, recreation, and fire science students.

16-3 FOREST TECHNOLOGY

These courses cover a wide range of techniques used in forest technology. Included are forest navigation, tree measurement, forest inventory and forest preservation against fire, insects and disease. The courses are intended for advanced students in forestry, fire science, and recreation programs. Courses dealing with the topics of equipment, log scaling, timber harvesting, and fire fighting are excluded.

16-4 FOREST PRODUCTS

These courses discuss the marketing, management and manufacture of wood products, pulp and paper. Courses are intended for forest technology study.

17 WILDLIFE AND WILD LANDS

Courses in this classification are intended primarily for students in fire science, parks and recreation, forest, fishery, and environmental technology programs. Maintenance, management and techniques involved are discussed in relationship to fisheries, wildlife, wild land, range, and water. These courses do not include fire fighting techniques or recreation principles.

17-1 Fisheries

17-2 Wildlife

17-3 Range

17-4 Wild land

17-5 Water

17-1 FISHERIES

All aspects of fishery technology are covered by courses in this category. Among major course topics are fish taxonomy, hatchery methods, history, disease symptomatology, treatment, and prevention. These courses are intended for fishery technology students.

17-2 WILDLIFE

Identification, management, population control of all game, birds, pests, predators, and waterfowl are primary topics covered by courses in this category. Current management practices and game regulations are included. Courses are intended for forest technology, parks and recreation, and fire science students.

17-3 RANGE

Management techniques of seeding fertilization, improvement water structure and pasture rotation are the primary topics covered in this category. These courses are intended for students in agriculture, forestry, parks and recreation and fire science programs.

17-4 WILD LAND

The courses in this category focus on wild land management for forestry and fire science students. Major topics include plant ecology, identification, environmental controls, field investigation, plant communities, and fire prevention. Courses on methods of fire fighting and recreation are excluded.

17-5 WATER

These courses discuss water resource development, hydrology, principles of water use, drainage, and erosion. These courses are intended for parks and recreation, and forestry students.

18 FOOD SCIENCE

Introduction to food industry, preparation, nutritional values, sanitation principles, and chemical properties of food are assessed by the courses in this category. These courses are intended for all students in food science and hotel/restaurant management programs. Cooking classes and hotel/restaurant management courses are excluded.

20 BIOLOGICAL SCIENCES

Includes major principles of introductory and advanced biology, botany, zoology, anatomy, physiology, microbiology, entomology, and ecology. More detailed descriptions and analyses can be found in the further breakdown in each of the following classifications.

21 - Biology - Introduction

22 - Biology - Advanced

23 - Botany

24 - Zoology

25 - Human

26 - Microbiology

27 - Entomology

28 - Ecology and Environmental

29 - Related Topics

21 BIOLOGY - INTRODUCTION

The subcategories of this classification cover the various levels of introductory biology. Major biological principles and concepts are introduced with respect to the student for whom intended. Major topics of the cell, reproduction, homeostasis, genetics, ecology, biochemistry, and energy are covered in varying detail by each subcategory. Independent study and courses focusing on specific biological problems are excluded. More advanced treatment of these principles is covered in Classification 23.

21-1 Non-Science Major Courses

21-2 Occupational Service Courses

21-3 Science Major Courses

21-4 Specialized Courses (Non-Science Majors)

21-1 NONSCIENCE MAJOR COURSES

The basic biological processes underlying life are covered by the courses in this category. The cell, energy, reproduction, homeostasis, genetics, and ecology, are covered to introduce the non-science major to major fields of biology, and to satisfy general education requirements.

21-2 OCCUPATIONAL SERVICES

Courses in this category are designed specifically for students in Occupational Health programs. Major biological principles related to health and disease as well as scientific terminology are introduced. Course content may vary with different program orientations.

21-3 SCIENCE MAJOR

Cell function and structure, genetics, related disease, microbiology, bacteriology, physiology, and chemistry, are within the scope of this category. These courses are intended to introduce science majors to biological principles and concepts and are pre-requisites for more advanced courses. Courses covering these principles in greater depth may be found under specialized classifications that follow.

21-4 SPECIALIZED COURSES - NON-SCIENCE MAJORS

These courses tend to be general education science courses for non-science majors. Elementary school science teaching methods and introductory courses in heredity are examples of courses included in this category. There are no pre-requisites for these courses and they do not carry credit for science majors.

22 BIOLOGY - ADVANCED

This classification embodies specialized courses examining important biological principles in detail. Techniques and quantitative evaluation methods are also introduced in advanced study of cellular biology, genetics, embryology/developmental biology, microtechniques, and population biology/evolution. These courses are open to science majors only and unless otherwise stated, have an introductory biology pre-requisite. Independent study and special topics courses are excluded.

22-1 Molecular/Cellular

22-2 Genetics

22-3 Embryology

22-4 Microtechniques

22-9 Population Biology/Evolution

22-1 MOLECULAR/CELLULAR

The courses in this category describe the cell as the basic unit of all living systems in terms of structure, function, and biochemistry. Differentiation, metabolism reproduction, and specialization are among the major topics covered. These courses are designed for science and health science majors of advanced standing.

22-2 GENETICS

These courses present an overview of Mendelian and population genetics with emphasis on genetic inheritance, mutation, influence on cell function, DNA and RNA. Genetic probability computation and disorder causes and effects are also included. Courses in this category are intended for science majors only.

22-3 EMBRYOLOGY/DEVELOPMENTAL BIOLOGY

The development of the human embryo and other organisms is studied from conception through major cell differentiation stages and prenatal development. Each developmental phase is examined in terms of growth environmental influences, and biochemical changes. These

courses are intended for science majors only.

22-4 MICRO-TECHNIQUES

Techniques for preservation and preparation of animal tissue for microscopic study are the focus of this category. Photomicrography, tissue staining, microtomy, tissue embedding and florescence are among topics covered. These courses are intended for science and health students of advanced standing.

22-9 EVOLUTION AND POPULATION BIOLOGY

Courses in this category cover the origins of life and the organic evolution of species. They expand into examination of population genetics, energy cycles, population dynamics, and the community as it interacts with the physical environment. These courses are intended for science students of advanced standing.

23 BOTANY

This classification consists of subcategories that examine the major aspects of Botany. The courses are assigned to subcategories with respect to the student for whom intended. Botanical principles of morphology, phylogeny, classification, ecology, physiology, and evolution are presented within each category with varying degrees of detail and specialization. More detailed ecological and environmental aspects of Botany are discussed in classification 28. Independent study and special topic courses are excluded.

23-1 Non-Science Major

23-2 Occupational Services

23-3 Science Major

23-4 Field Botany

23-1 NON-SCIENCE MAJOR COURSES

The courses in this category generally focus on regional flora and offer students an introduction to plant science. Family characteristics of vascular plants, phylogeny, and classification are studied with reference to evolution, ecology, pathology, and economic importance to man. These courses may be taken to fulfill general education science requirements. Courses of this type are not intended for students in science programs.

23-2 OCCUPATIONAL SERVICE COURSES

Occupational service courses are pre-professional introductory botany courses for occupational students in agriculture, forestry, range management, conservation, and horticultural science programs. Course content includes plant propagation, an introduction to the plant kingdom, morphology, and ecology. These courses may also fill general education requirements for non-science students. Courses of this type are not acceptable for science majors.

23-3 SCIENCE MAJOR COURSES

Introductory survey of taxonomy, morphology, phylogeny, physiology, ecological and evolutionary constructs are topics covered by courses in this category. Understanding the physiological processes of osmosis, respiration, transpiration, photosynthesis, reproduction and metabolism of vascular/non-vascular plants and their ecological relevance are primary course goals in order to prepare science majors for more advanced study. Practical field courses are discussed in category 23-4.

23-4 FIELD BOTANY

Practical field experience and the examination of local flora as part of a functional ecosystem are within the scope of courses in this category. Collection, identification, and examination techniques as well as discussion of population dynamics are included in course content. Courses in this category are intended for science and non-science majors. Those courses specifically for science majors are designated by an introductory biology or botany prerequisite and treat the above topics in greater depth.

24 ZOOLOGY

The students for whom intended determine the categories of this classification. Basic animal biology, taxonomy, anatomy and physiology, behavior, relationship to man, and terminology are presented to non-science and occupational students at various levels of detail. Introductory topics with additional emphasis on vertebrate and invertebrate biology, gross and microscopic anatomy and physiology, and orientation to phylogenic classification are within the scope of courses for science majors. Specialized courses in gross and microscopic animal anatomy and physiology are categorized for advanced biological science students. Elective general education courses in ornithology are also included in this classification.

24-1 Non-Science Major Courses

24-2 Occupational Service Courses

24-3 Science Major Courses

24-4 Animal Anatomy and Physiology

24-1 NON-SCIENCE MAJOR COURSES

These courses, an introduction to local fauna, survey basic animal biology, taxonomy, natural history, relationship to man, anatomy, physiology, animal behavior, genetics, and animal ecology. Students are also acquainted with major phyla of the animal kingdom. The courses of this type fulfill general education requirements and are not intended for science majors.

24-2 OCCUPATIONAL SERVICES

Basic biology, anatomy, physiology, and behavior of animals are covered by courses of this type. Zoological terminology and technique are introduced to students in agriculture, animal science, forestry, range management, and environmental programs. These courses are not intended for science majors.

24-3 SCIENCE MAJOR

Principles of vertebrate and invertebrate biology are presented in courses of this type. Topics considered are gross and microscopic anatomy, embryology, classification, geographic distribution and

relationship to man and environment. Courses of this type are designed for pre-med, pre-vet, allied health, and other science students.

24-4 ANIMAL ANATOMY/PHYSIOLOGY

These courses present a comparative study of evolutionary development of vertebrates. Microscopic and gross anatomical systems as well as their physiological function are considered. The courses are intended for science students who seek more advanced and detailed treatment of animal biology.

24-9 ORNITHOLOGY

Courses in this category are general education courses that discuss evolution, geographic distribution, territoriality, migration, and field identification. These courses are intended for all students and carry elective credit.

25 HUMAN BIOLOGY

Human biology, anatomy and physiology are the topics covered across the subcategories of this classification. Course content and depth are determined by the students enrolled and are reflected here by each subcategory. Courses in human biology are intended for all students, and survey the relationships between body structure and function and the principles of health and disease. General anatomy and physiology acquaint the science major with human body structure and function on cellular, molecular, and biochemical levels. The courses for allied health should cover major anatomical systems and their physiological functions from a medical standpoint. More advanced courses for allied health students teach hematology, serology, blood banking and urinalysis, and include clinical practice and procedure. Specialized courses for pre-med, medical laboratory technicians, pre-dental, dental assistant and hygiene students are treated in their own sub-categories. Courses in clinical internships, laboratory equipment orientation, diagnostic procedure, and medical office/ hospital orientation are excluded.

25-1 Human Biology

25-2 Anatomy and Physiology - General

25-3 Anatomy and Physiology for AHS

25-4 Specialized Anatomy and Physiology

25-5 Medical

25-6 Dental

25-1 HUMAN BIOLOGY

A general overview of anatomy, physiology, genetics and evolution is presented in courses of this type. The relationship between

structure and function is stressed, and principles of health, disease prevention and control are introduced. These courses are intended primarily for students in para-medical careers, such as medical assistant, medical secretary, nursing assistant or for students seeking to fill general education requirements.

25-2 HUMAN ANATOMY AND PHYSIOLOGY - GENERAL

These courses examine the human body on cellular, molecular, structural, and functional levels. Physical and chemical principles are introduced with relation to major organ systems and their physiological processes. These courses are intended for science majors only.

25-3 ANATOMY AND PHYSIOLOGY FOR ALLIED HEALTH STUDENTS

These courses are a comprehensive survey of major anatomical systems and their physiological function. Integumental, skeletal, muscular, circulatory, digestive, respiratory, urogenital, sensory, nervous, and endocrine systems are examined in terms of physical, chemical, and medical aspects. The courses are intended for allied health, nursing, and other - health program student. Medical terminology courses are excluded.

25-4 ANATOMY AND PHYSIOLOGY - SPECIALIZED

The courses in this category are designed for allied health and medical laboratory technology students. Hematology, immuno-serology, blood banking, and urinalysis are the major areas covered by these courses. Proficient clinical practice and preparation for state licensing are among course goals. Internships for credit and technical orientation courses are not included in this category.

25-5 ANATOMY AND PHYSIOLOGY - MEDICAL

The human body, and disease process are examined by courses in this category. Basic anatomical organization, structure, organ systems, common pathological conditions, their causes and effects related to these systems, are major elements of course content. Heredity, environmental factors, and pharmacology are also included. These courses are specifically intended for pre-medical, medical-laboratory technology, operating room assistants, and nursing students. Clinical seminars, medical terminology, diagnostic procedure, and orientation to monitoring equipment are not excluded.

25-6 ANATOMY AND PHYSIOLOGY - DENTAL

Oral anatomy, physiology, head and neck anatomy, oral pathology, disease, inflammation, repair, terminology, prosthesis, hygiene, tooth morphology, preventative dentistry, peridontology are covered by courses in this category. These courses are intended for dental assistant, hygiene, and pre-dental students only. Technical orientation, equipment, and clinical practice are excluded.

26 MICROBIOLOGY

General characteristics of microorganisms, bacteria, and parasites are covered by the categories in this classification. Introductory microbiology emphasizes basic microbiology principles and techniques and is intended for all science students. Bacteriology introduces the science and health students to bacteria as they pertain to the disease process. Microbiology for special groups focuses on the needs of special groups in the presentation of basic microbiological principles, parasitology and bacteriology. Technical orientation, clinical procedure, and clinical practice courses are not included.

26-1 Microbiology

26-2 Bacteriology

26-3 Microbiology for Special Groups

26-1 GENERAL MICROBIOLOGY

Courses in this category survey general characteristics of major microorganisms. Virulence, morphology, physiology, control methods, and microbial techniques are the main emphasis of these courses. Courses of this type are intended for science and health occupation students and require a general biology course.

26-2 GENERAL BACTERIOLOGY

Basic techniques, terminology, principles, and medical applications are introduced by courses in this category. Staining, culturing, isolation, and identification of bacteria are studied in relation to infectious diseases. These courses are intended for science students of advanced standing as well as students in medical technology programs.

26-3 MICROBIOLOGY FOR SPECIAL GROUPS

The principles and techniques of microbiology, parasitology, mycology and bacteriology are combined in courses of this type. The students for whom intended determine the course content. Examples of courses in this category include microbiology for bio-medical, pre-veterinary, allied health, food science, and agriculture students. Technical orientation and clerical procedure courses are excluded.

27 ENTOMOLOGY

The two categories in this classification cover the principles of entomology, classification, and identification of major insect species. Category 27-1 is an introductory survey course for science students. More specialized study of entomology is considered by courses in category 27-2.

27-1 Entomology

27-2 Entomology for Special Groups

27-1 ENTOMOLOGY

Biology and classification of insects are the focus of courses in this category. Evolution and control of major species are also considered. These courses generally require a course in general zoology and are intended for science majors.

27-2 ENTOMOLOGY FOR SPECIAL GROUPS

The courses in this category examine insect classification, structure, ecology, economic importance and control. The beneficial as well as hazardous aspects to animals, plants, and man are considered. These courses are generally directed to agriculture, horticulture, and farm management students.

28 ECOLOGY AND ENVIRONMENTAL

Ecological principles of environmental biology are presented to science and non-science students in the sub-categories of this classification. Populations, ecosystems, energy concepts communities, pollutants, homeostasis, and marine biology are primary concerns of these categories. Field study, collection techniques, and quantitative analysis of these topics are also included. Most courses included in these categories require an introductory biology course. Independent study, special topics, and travel seminars are not included.

28-1 Non-Science Major Courses

28-2 Science Major Courses

28-3 Field and Nature Courses

28-4 Marine Courses

28-1 NON-SCIENCE MAJOR

These courses introduce ecological principles of environmental biology, populations and communities. The sources and effects of pollutants, the relationship of plants, animals, and man to the environment, and the concept of ecosystems are considered. Courses of this type are intended for all students.

28-2 SCIENCE MAJOR COURSES

The courses in this category survey major ecological themes and are intended for science majors as well as for students in horticulture, fire science, range management and forestry. Population regulation, community structure, and ecosystems are included in course content. The effect of ecological systems on homeostasis, energy concepts, and the integration of living organisms are also discussed.

28-3 FIELD AND NATURE

Field analysis of specific ecosystems, natural history of the community, population analysis, field data collection, including transects, quadrats, collection methods, and taking of field notes, are surveyed by these courses. They are designed for science majors and students in forestry, parks and recreation, fire science, horticulture and range management.

28-4 MARINE COURSES

These courses focus on hydro - and marine biology. Hydrobiology includes study of aquatic habitats, chemical analysis, and organism collection and analysis. Marine biology examines ocean environments in terms of the living organisms that habitate them, field study, collection methods, and analysis techniques are also included. Courses of this type are intended primarily for science students.

29 RELATED TOPICS

The categories in this classification present an overview of principles of nutrition, pharmacology, radiation, environmental pollutants, and biological science teaching methods. Courses in clinical application, clinical procedure, and special equipment orientation and function, are excluded.

29-1 Nutrition

29-2 Pharmacology

29-3 Radiation effects and Environmental Pollutants

29-4 Teaching Methods

29-1 NUTRITION

Courses of this type offer comprehensive analysis of nutrition principles and health. Nutrients, their function, digestion, absorption, metabolism, and human needs are discussed. These courses are intended for all students.

29-2 PHARMACOLOGY

These courses examine principles of pharmacology for students in various health occupations. Drug types, usage, dispensing, contra-indications, and federal regulations are the primary topics covered. Actual course content is dependent on the students for whom intended. Some courses require chemistry and biology background.

29-3 RADIATION EFFECTS AND ENVIRONMENTAL POLLUTANTS

Courses studying the biological effects of radiation, measurement of radiation, hazards, and protection methods are included in this category. They are primarily intended for students in radiation therapy and X-ray technician programs. Also included in this category are courses examining environmental pollutants and their effects on man and environment. These courses are intended for all students.

29-4 TEACHING METHODS

These courses focus on methods of teaching biological science in elementary schools. Courses of this type are intended for child study and education students.

30 ENGINEERING SCIENCES AND TECHNOLOGIES

Includes courses and programs having to do with the practical application of basic scientific knowledge to the design, production, and operation of systems intended to facilitate man's control and use of his natural environment. More detailed descripions and analyses can be found in the further breakdown in each of the following classifications:

31 - Engineering - General

32 - Engineering Graphics and Design

33 - Civil Engineering Technology

34 - Electrical/Electronic Engineering and Technology

35 - Materials

36 - Mechanical Engineering

37 - Industrial Engineering Technology

38 - Aeronautical, Automotive and Combustion Engineering

39 - Other Engineering and Technology Fields

31 GENERAL ENGINEERING

Courses within this area provide a broad introduction to the fields of engineering and engineering technology by orienting students in these programs to engineering in general as well as specific fields such as mechanical and civil. This group also includes general engineering problems, courses that deal with problem solving techniques and tools, as well as some applications of fundamental physical science and mathematical principles to engineering systems.

31-1 Introduction to Engineering and Engineering Technology

31-2 Engineering Problems

31-1 INTRODUCTION TO ENGINEERING AND ENGINEERING TECHNOLOGY

Courses within this category serve to introduce the engineering and engineering technology student to the professions that they have selected to study. These courses address such topics as the various professional fields encompassed within engineering, the educational requirements for entrance and the character of work within each field. They may also deal with engineering problems students may encounter in their advanced studies.

31-2 ENGINEERING PROBLEMS

Included within this category are courses that introduce the student to the methods and tools employed in problem solving, conceptual design, and analysis. Many of these courses cover calculations, scientific notation, formula manipulation, metric system conversion, computer programming, and interpretation of charts, tables, and graphs. Courses may include such subject matter as designing for production, automation, prototype and laboratory models, tape programming, and verification.

32 ENGINEERING GRAPHICS AND DESIGN

The courses included herein are intended to develop within engineering and engineering technology students the abilities to portray and analyze engineering systems graphically; to interpret graphical presentations of engineering systems; and to apply the principles of mathematics, physics, chemistry and the engineering sciences to the design of specific components or total engineering systems. They include the engineering drawing and graphics courses plus descriptive geometry and design courses of all types, as well as such specialized courses as electronic drafting. The courses in this category include only those for the transfer engineering programs, the higher level electronic technology programs (ECPD accredited programs) and those that do not deviate considerably from these with respect to mathematics and science requirements. Excluded are courses for training draftsmen, for the less rigorous technical programs, and for the trades.

32-1 Engineering Drawing and Drafting

32-2 Engineering Graphics

32-3 Descriptive Geometry

32-4 Design

32-5 Electrical and Electronic Drafting

32-6 Other Graphics Courses

32-1 ENGINEERING DRAWING AND DRAFTING

These courses are fundamental drawing and drafting courses that are designed to provide engineering and engineering technology students with

knowledge of drafting tools and techniques. Included within these courses are drafting fundamentals, ASA approved lettering techniques, orthographic projection, layout procedures, geometric construction, isometric drawing, selection of views, sectional auxiliary views, and dimensions. Many of these courses are designed to orient students to the knowledge and techniques of specific fields of engineering, i.e. civil engineering and mechanical engineering technology.

32-2 ENGINEERING GRAPHICS

Engineering graphics courses are designed for those engineering and engineering technology students who need to obtain an understanding of the graphical methods utilized in engineering design, layout and calculation. Topics covered in such courses may include drawings and theories of projection, multiview drawings, geometrical construction, assembly drawing, study of vector geometry, and properties and types of graphs for engineering and scientific purposes.

32-3 DESCRIPTIVE GEOMETRY

These courses present to engineering and engineering technology students rules and theorems necessary for graphical solution of simple vector problems and complex projection problems. Topics addressed in these courses may include the following: problem analysis and graphic presentation of the space relationship of fundamental geometric elements, auxiliary views, true length, shape, angle, and point-line-plane through the use of revolution.

32-4 DESIGN

Includes courses that provide experience in applying the knowledge gained in such engineering science courses as statics, strength of materials, and kinematics, as well as mathematics, physics, and properties of materials to the design of engineering systems or components of engineering systems. For example, a machine design course would include the design of machine components including shafts, gears, bearings, fasteners and springs. Courses may be oriented around applications to a small design project. This category also includes design type courses in architecture, building construction technology and landscape which are included in a curriculum of the appropriate level. These courses also generally require the completion of previous courses in drawing or graphics.

32-5 ELECTRICAL AND ELECTRONICS DRAFTING

Courses included within this category are designed primarily for electrical and electronic technology students and, in general, require prior familiarization with electrical and electronic principles. Such topics as graphing of typical electrical data, electronic symbols, printed circuit design, block diagrams, discrete and integrated schematics, logic drawings, working drawings, and standards for electronic drawings may be addressed in these courses.

32-6 OTHER GRAPHICS COURSES

This category includes those courses that are graphical or design in nature but that do not fit any of the above categories. These courses tend to deal with special or advanced aspects of mechanical and civil engineering technologies and other programs.

33 CIVIL ENGINEERING

The courses included in this category are both elementry and advanced courses in surveying for engineering transfer students and civil engineering and surveying technology students as well as the service courses in surveying for programs such as forestry, building construction, architecture, etc. Other courses traditionally considered as a part of civil engineering have been placed elsewhere, i.e. topographic drawing and mapping in 53-7, and structural design and construction in 32-4 and 36-2.

33-1 Introduction to Surveying

33-2 General Surveying -- Service Courses

33-3 Specialized and Advanced Surveying

33-1 INTRODUCTION TO SURVEYING

Courses within this category are designed primarily for civil engineering technology, surveying techology, and engineering transfer students. They serve to orient the student to the theory of plane surveying, basic surveying operations, use of instruments and equipment, instrumental error, use of traverse and levels, topographic methods and mapping, and route surveying, including layout and planning. They are mainly focused upon the application of surveying in engineering construction.

33-2 GENERAL SURVEYING -- SERVICE COURSES

This category encompasses those surveying courses that satisfy the surveying requirements of such programs as forestry, ornamental horticulture, geology, and building constr u ction. Their primary objective is to orient the student to those surveying techniques that are utilized in specific fields, as well as to introduce in a general manner the use of surveying equipment and instruments and surveying principles.

33-3 SPECIALIZED AND ADVANCED SURVEYING

In general, courses included within this category are of an advanced nature, requiring a minimum proficiency in the application of basic surveying fundamentals. Therefore, these courses are mainly directed to those second-year students who are specializing in specific areas of civil engineering technology, surveying technology, architecture, and engineering related technology and transfer programs. Courses within this category may emphasize the application of surveying theory and techniques to complex problems related to such areas as highway design and construction and building design and construction.

34 ELECTRICAL/ELECTRONIC TECHNOLOGY

The Electrical/Electronic Technology category includes introductory and advanced level as well as specialized courses. The principles of electricity, both DC and AC, serve as the base for practically all courses in Electrical and Electronic Technology. Students served by these courses are primarily those in the electronic and electrical technology programs, although many service courses are included for other technologies, as well as some trades. Transfer electrical and electronic engineering courses and more specialized electronics, e.g., communication and biomedical, as well as electronics for industry are also included in this category. Courses emphasizing radio and television servicing, broadcast engineering, or maintenance and troubleshooting are not included. Also not included are courses emphasizing electromechanical systems--these courses are found in Mechanical Engineering (36)

34-1 Introductory Electrical Theory

34-2 Electrical Technology

34-3 Electrical Circuits

34-4 Introductory Electronics (Service)

34-5 Introductory Electronics (Technology)

34-6 Advanced Circuits

34-7 Specialized Electronics

34-8 Industrial Electronics

34-9 Other

34-1 INTRODUCTORY ELECTRICAL THEORY

These first courses in electrical/electronic related technology cover direct current and alternating current theory, Ohm's law, Kirchhoff's law, conductors, voltage, parallel circuits, resistance, magnetism and electromagnetism, and other characteristics of electrical circuits. These courses provide the fundamentals to students entering most technology or trade programs requiring a basic knowledge of electricity.

34-2 ELECTRICAL TECHNOLOGY

These courses are usually designed for electrical technology programs. Advanced topics in electrical theory for electricians, electrical instruments and measurement,and electrical devices and machines provide the major content areas. Courses in electrical power distribution are included in this category.

34-3 ELECTRICAL CIRCUITS

Only courses on circuits for students in transfer engineering programs are included within this category. These courses have a calculus and/or physics prerequisite and usually involve circuit network analysis.

34-4 INTRODUCTORY ELECTRONICS (SERVICE)

These electronic courses are designed for students not majoring in either electronics or electrical technology programs. They provide basic electronics fundamentals mainly for students in the service trades, such as radio and TV, air conditioning, agriculture, and appliance repair, and for students who have a general interest in electronics. Some of the courses deal with specific electronic applications in the student's occupational program, while others provide a more general overview of electronics and electricity.

34-5 INTRODUCTORY ELECTRONICS (TECHNOLOGY)

These courses designed for electronic technology majors include fundamentals of electronics, simple electronic circuits, electronic devices, such as transistors, amplifiers, and oscillators, and electronic instruments and measurement. Courses introducing these students to the general field of electronics are also included within this category.

34-6 ADVANCED CIRCUITS

These courses on advanced circuitry are designed for any electronic related program. The courses usually examine a specific type of circuit, such as solid state, linear and/or integrated, digital, pulse, and switching circuits, but this category also includes general advanced circuitry courses that encompass two or more of the specific circuits noted above.

34-7 SPECIALIZED ELECTRONICS

Courses within this category form programs dealing with specialized electronics, primarily communications and biomedical electronics. The courses included may focus on the use and testing of instrumentation within these areas.

34-8 INDUSTRIAL ELECTRONICS

Courses within this category deal with common electronics applications in industrial settings. The courses may be general in nature or may

focus on power systems, electrical motors, electronic devices, or instruments and measurement. These courses are designed for electronic technology students or industrial technology students.

34-9 OTHER

Electronics courses with a focus other than those described above are included within this category.

35 MATERIALS

This category contains courses concerned with the structure, properties and uses of various materials, as well as the testing and processing of these materials. The types of materials (metals, plastics, etc.) included depend on the emphasis of the program(s) for which the course is intended. These courses may be part of such programs as transfer engineering, metallurgical engineering technology, or other engineering technologies.

35-1 Properties and Uses

35-2 Testing

35-3 Processes and Materials

35-4 Metals - Metallurgy

35-1 PROPERTIES AND USES

The internal structure and specific characteristics of a variety of materials, such as metals, wood, plastics, textiles, concrete, paper are included within this category. The included properties are generally physical and chemical, although electrical and magnetic properties may also be considered. The uses of these materials as functions of their properties are often included.

35-2 TESTING

These courses include techniques for both the destructive and nondestructive testing of materials. Courses that include both the testing and the properties of materials are primarily found in the preceding category.

35-3 PROCESSES AND MATERIALS

These courses examine the industrial processes by which certain materials are obtained from raw materials or other products. Courses which emphasize the forming or fabrication of these materials in manufacturing processes, rather than the processing of materials, are placed in the industrial engineering (37) area. Courses include such materials as metals, plastics, textiles, concrete, and paper. However, courses pertaining exclusively to metallurgy are contained within the following category.

35-4 METALS - METALLURGY

These courses deal primarily with physical and chemical metallurgy although they may also include those properties of metals and their testing relevant to their metallurgy. Metals for specific uses, such as dental metals, may also be the topic for courses within this category.

36 MECHANICAL ENGINEERING

This category encompasses courses covering mechanical principles such as statics, dynamics, fluids, and thermodynamics. It also includes courses on electromechanical systems and machine and structural design. These courses form part of mechanical engineering technology curricula and other programs which depend on knowledge of mechanical principles, such as architecture, air conditioning and refrigeration, and fire science.

36-1 General Mechanics

36-2 Statics, Strength of Materials, Structural Design

36-3 Dynamics, Kinematics, Mecahnisms, Machine Design

36-4 Fluids, Hydraulics, and Pneumatics

36-5 Thermodynamics

36-6 Electromechanical systems

36-7 Statics and Dynamics

36-9 Other

36-1 GENERAL MECHANICS

These courses include a general overview of several of the mechanical principles or the fundamental concepts behind these principles, such as Newton's laws or vector algebra or calculus. Courses on the instruments and their use for the mechanical engineering technician are also included within this category.

36-2 STATICS, STRENGTH OF MATERIALS, STRUCTURAL DESIGN

Courses within this category cover the principles of statics, resultants and equilibrium of force systems, frame and trusses, beams, centroids, moments of inertia, dry friction, and stress and strain analysis. Statics, strength of materials, and structural design may be included in engineering programs or applied curricula, such as architecture.

36-3 DYNAMICS, KINEMATICS, MECHANISMS, MACHINE DESIGN

These courses include such topics as rectilinear and curvilinear motions, Newton's laws of motion, D'Alembert's principle, rotation of rigid bodies, and balancing, work, energy, and power. Also within this category are machine design courses which cover machine elements, such as fasteners, shafts, gears, linkages, couplings, cams, bearings, clutches, brakes, and the synthesis of these elements.

36-4 FLUIDS, HYDRAULICS, AND PNEUMATICS

Courses within this area examine the principles of fluids, hydraulics, and pneumatics. Fluid courses focus on the properties of fluids, fluid flow, Bernoulli's theorem, measuring devices, viscosity, and dimensional analysis. Courses in this area may be found in fire science and mining, as well as mechanical engineering, curricula.

36-5 THERMODYNAMICS

Courses cover the heat and energy of gases. Although the courses may have an applied component to such areas as air conditioning, refrigeration, and the study of steam cycles and combustion processes, the theoretical concepts,rather than the "hands on" experience,are emphasized in these courses. Courses on psychrometrics are also included within this category.

36-6 ELECTROMECHANICAL SYSTEMS

These courses examine systems which combine devices and circuits based on both electrical and mechanical principles. These systems include hydraulic, pneumatic, vacuum, thermal, and electrical components. Included within this category are courses on control devices covering such basic automatic control systems as on-off, proportional, proportional plus reset, proportional plus reset plus rate. These courses on control systems often emphasize the variety of system inputs, such as temperature change, pressure variation, rate of flow, and other physical conditions. Courses on the electromechanical components of other machines, e.g. vending and business machines, are also included within this category.

36-7 STATICS AND DYNAMICS

These courses examine the principles described in both 36-2 and 36-3 above.

36-9 Other

Courses covering other topics related to mechanical engineering science fall within this category.

37 INDUSTRIAL ENGINEERING TECHNOLOGY

Courses within this category examine industrial engineering concepts utilized in industry, such as materials and processes used in manufacturing, quality control, precision measurement techniques, work achievement, and industrial safety. These courses are most often offered as part of an industrial technology program.

37-1 Industrial Engineering-Introduction

37-2 Manufacturing Materials and Processes

37-3 Quality Control

37-4 Metrology and metrics

37-5 Work Achievement (Time and Motion Studies)

37-6 Industrial Safety

37-1 INDUSTRIAL ENGINEERING-INTRODUCTION

Courses within this category are general introductions to the field of industrial technology. These courses include an overview of manufacturing processes, quality control, and measurement of work and may be utilized as an introduction to a specific industry, such as mining.

37-2 MANUFACTURING MATERIALS AND PROCESSES

This category includes courses on the materials and processes of industry from a drafting and design point of view. Courses include topics,such as material and equipment involved in selecting a manufacturing method and the construction, purpose, and operation of all standard machine tools and special high production type machine tools.

37-3 QUALITY CONTROL

Courses within this category examine concepts and techniques of quality control, quality control requirements of various industries, test equipment, cost analysis, surveys, and quality control relationships with production, inspection, and engineering. Those courses emphasizing the statistical methodology utilized in quality control have been placed in the math category (44).

37-4 METROLOGY AND METRICS

These courses cover the science of measurement including mechanical, electrical, and physical methods. Such issues as traceability, classification of errors and values, calibration and certification procedures may be included. The relationship of precise measure to design practice and production process may be emphasized.

37-5 WORK ACHIEVEMENT (TIME AND MOTION STUDIES)

Courses within this category examine the basic laws of motion economy and work simplification. Methods and standards, recording and analysis techniques involved in planning and improving man-job-time relationships are included.

37-6 INDUSTRIAL SAFETY

These courses examine safety practices within industrial settings . Techniques and analysis of occupational safety are emphasized.

38 AERONAUTICAL, AUTOMOTIVE AND COMBUSTION ENGINEERING

Courses included in this category are those which consider the theory and principles related to the design and operation of the engineering type systems characteristic of airplanes, space vehicles, and automobiles. Courses concerned with the combustion of various fuels in both stationary and mobile systems are also included. Specifically excluded are courses dealing with the trouble-shooting, servicing, maintaining or repairing of such systems, as well as training operators for them.

38-1 Aeronautical Engineering

38-2 Automotive Engineering

38-3 Combustion Engineering

38-1 Aeronautical Engineering

Includes courses which cover the fundamental principles including design of aeronautical and space vehicles, their engines and other systems for students in aeronautical and space technology programs. Specifically excluded are courses primarily concerned with operation, maintenance, servicing, and trouble shooting.

38-2 Automotive Engineering

Includes courses which cover the fundamental principles including design of automotive engines for students in automotive technology programs. Does not include courses primarily concerned with operation, maintenance, servicing or trouble shooting.

38-3 Combustion Engineering

Includes courses which cover the fundamental principles including design of combustion engines and the burning of fuels therein. Specifically excluded are service and operation oriented courses.

39 OTHER ENGINEERING AND TECHNOLOGY FIELDS

This miscellaneous grouping includes more specialized areas of engineering and technology not widely found in the two-year colleges. The types of courses included are similar to the other categories but are concerned with mining and petroleum engineering as well as the nuclear, vacuum, optical and solar fields.

39-1 Mining Engineering and Technology

39-2 Nuclear Engineering and Technology

39-3 Optical Engineering and Technology

39-4 Petroleum Engineering and Technology

39-5 Solar Engineering and Technology

39-1 MINING ENGINEERING AND TECHNOLOGY

Includes basic courses designed for mining technology students which consider the principles and/or methods related to the exploration, development, extraction, processing, testing and reclamation of coal and other minerals. Also includes courses concerned with mine safety and design. Mine equipment studies are included when they are not primarily concerned with operation and care of the equipment.

39-2 NUCLEAR ENGINEERING AND TECHNOLOGY

Includes courses dealing with the application of radioisotopes and nuclear equipment and techniques in industrial settings. These include industrial applications of nucleonics, nuclear instrumentation, effects of radiation on materials, safety, nuclear fuel processing, nuclear power generation, etc.

39-3 OPTICAL ENGINEERING AND TECHNOLOGY

Includes courses dealing with the manufacture and application of optical equipment and techniques in industrial settings. Courses primarily concerned with the principles of geometrical and/or physical optics are included in 56, whereas those concerned with opthalmic dispensing techniques are excluded. These courses include the use of optical tools and instruments, optics fabrication, deposition of thin films, and optical design.

39-4 PETROLEUM ENGINEERING AND TECHNOLOGY

Includes basic courses designed for petroleum technology students that consider the principles and/or methods related to the exploration, development, extraction, processing, testing and reclamation of coal and other minerals. Also includes courses concerned with well and pipeline safety and design. Drilling and other equipment studies are included when they are not primarily concerned with operation and care of the equipment.

39-5 SOLAR ENGINEERING AND TECHNOLOGY

Includes courses concerned with the nature, availability and distribution of solar energy as well as the design and utilization of equipment for the collection, storage, and distribution of energy from the sun.

40 MATHEMATICS AND COMPUTER SCIENCES

Includes courses and programs dealing with the science of numbers and their application to a wide variety of fields (e.g., engineering, business, natural sciences). Courses in this category range from remedial math and college algebra to more advanced topics, such as the calculus and differential equations. This category also includes courses concerned with the understanding, use, programming and operation of computers.

41 - Introductory - Intermediate Mathematics

42 - Advanced Mathematics

43 - Applied Mathematics - Technology Related

44 - Mathematics for Majors

45 - Statistics and Probability

46 - Computer Science and Technology

41 INTRODUCTORY - INTERMEDIATE MATHEMATICS

This classification includes courses in remedial (basic arithmetic, pre-algebra), introductory (elementary algebra, basic geometry), and intermediate (college algebra, trigonometry, pre-calculus math) mathematics. These courses are usually available in secondary schools.

41-1 Pre-Algebra

41-2 Introductory Algebra

41-3 Geometry

41-4 Intermediate Algebra and Trigonometry

41-5 College Algebra and Trigonometry (Pre-Calculus)

41-1 PRE-ALGEBRA

These courses are designed for students who need a review of basic skills and applications of arithmetic. Topics covered in these courses include: operations with whole numbers, fractions, decimals, percents, and simple equations. Concepts useful in algebra are emphasized.

41-2 INTRODUCTORY ALGEBRA

These courses are designed for students with no background in Algebra and for those who need a review of fundamentals typically covered in the first-year of high school algebra. Topics include functions, exponents, radicals, factoring, complex numbers, and linear and quadratic equations in one variable.

41-3 GEOMETRY

These courses are designed for students who have not had a course in high school geometry and who need some knowledge of geometry in order to take more advanced math in such areas as trigonometry and the calculus. Concepts of Euclidean geometry including lines, angles, polygons, and circles are typically covered in these courses.

41-4 INTERMEDIATE ALGEBRA AND TRIGONOMETRY

This category includes intermediate algebra (equivalent to second year high school algebra), basic trigonometry, and integrated courses in algebra and trigonometry. Topics discussed include factoring, linear and quadratic equations, functions and graphs, complex numbers, exponents, radicals, logarithms, and the binomial theorem.

41-5 COLLEGE ALGEBRA AND TRIGONOMETRY (PRE-CALCULUS)

These courses are designed to provide students with a suitable foundation for more advanced study in math - especially in analytic geometry and the calculus. Topics covered include: solutions of linear and quadratic equations; graphing techniques; complex numbers; sequence and series; properties of polynomials, rational, logarithmic, and exponential functions; and theories of equations.

42 ADVANCED MATHEMATICS

This classification includes courses in analytic geometry, first year calculus, second year calculus, advanced topics (e.g., differential equations, vectors), and linear algebra. Courses are generally designed for students majoring in mathematics, engineering, physics, chemistry, and closely related areas.

42-1 Analytic Geometry

42-2 First Year Calculus

42-3 Second Year Calculus

42-4 Advanced Topics

42.5 Linear Algebra

42-1 ANALYTIC GEOMETRY

Topics covered in these courses include rectangular and polar coordinates, the straight line, conic sections, vectors, algebraic and transcedental functions, parametric equations, transformations of coordinates, and graphing. College algebra and trigonometry typically serve as prerequisites.

42-2 FIRST YEAR CALCULUS

Topics covered in these courses include relations, functions, the line, curve sketching, limits, continuity, differentiation and integration of algebraic functions, and techniques of integration, analytic geometry of space, sequences, and series. Four years of preparatory math or pre-calculus math serve as prerequisites

42-3 SECOND YEAR CALCULUS

This category includes courses in second year calculus, complex variables, and combinations of analytic geometry and advanced calculus. Topics covered in these courses include solid analytic geometry, vectors, infinite series, partial differentiation and integration of indeterminate forms, and multiple integration. Courses are typically intended for the student interested in a career in math, science and engineering.

42-4 ADVANCED TOPICS

This category is comprised primarily of courses in differential equations and, to a lesser extent, vector analysis. Special topics of differential equations and their applications are considered.

42-5 LINEAR ALGEBRA

Topics covered in these courses include abstract algebraic structures, elementary matrix algebra, vector spaces, systems of linear equations, vector spaces, and linear transformations. Analytic geometry and calculus serve as prerequisites.

43 APPLIED MATHEMATICS - TECHNOLOGY RELATED

This classification includes courses designed to fulfill the mathematics requirements of the various engineering and science-related technologies. Topics are generally selected with consideration of the utilization of mathematics in these fields and include applications selected from the related technologies. Courses from basic arithmetic to advanced calculus are in this category.

43-1 Pre Algebra

43-2 Algebra Through Trigonometry

43-3 Calculus

43-1 PRE ALGEBRA

These courses are designed to develop students' competencies in basic arithmetic needed to solve everyday problems in a technological field as well as for those who plan to take more advanced math courses. Topics covered include fractions, decimals, percentages, ratios, proportions, and conversion of units.

43-2 ALGEBRA THROUGH TRIGONOMETRY

This category includes courses in applied algebra, geometry, and trigonometry. These courses stress practical applications of mathematics to technological problems.

43-3 CALCULUS

This category includes courses in differential and integral calculus and, to a lesser extent, analytical trigonometry. The emphasis of these courses is on the ways that the fundamental ideas and methods of calculus can be applied to problems in the appropriate technological fields.

44 MATHEMATICS FOR MAJORS

This classification includes courses designed to fulfill the mathematics requirements of programs in business, social science, allied health, agriculture, natural resources, and education. Topics, generally selected by considering the use of mathematics in these fields, include applications selected from the students' areas of major interest.

- 44-1 Non Calculus - Liberal Arts/Education/Social Science
- 44-2 Non Calculus - Business
- 44-3 Non Calculus - Biological Science/Allied Health/Agriculture
- 44-4 Calculus

44-1 NON CALCULUS - LIBERAL ARTS/EDUCATION/SOCIAL SCIENCES

These courses are designed for students in the liberal arts, education, and the social sciences. Topics covered in these courses include concepts of numbers, arithmetic operations, basic college algebra, geometry, probability and statistics.

44-2 NON CALCULUS - BUSINESS

Courses in this category are specifically designed for students majoring in business. These courses include basic math processes used in single business activities - working with bank records, payrolls, taxes, statistics, financial statements, insurance, securities, annuities, and trade discounts.

44-3 NON CALCULUS - BIOLOGICAL SCIENCE/ALLIED HEALTH/AGRICULTURE

Courses in this category are designed to give students in biological science, allied health, and agriculture - oriented programs proficiency in performing math computations in such areas as quality control, preparation of solutions, calculation of dosages, dilutions, chemical solutions, and machine rates. Topics covered typically include fundamental arithmetic and algebraic manipulations.

44-4 CALCULUS

These courses are intended for non-science majors who desire an intro-

45 STATISTICS AND PROBABILITY

This classification includes courses designed to introduce the student to the fundamentals of probability and statistics. Courses in this classification vary primarily in their area of emphasis. The focus of these offerings include: general surveys of elementary probability and statistics; applications of statistics for business majors; statistics for students in engineering and technological fields (e.g., engineering statistics; application of statistics in quality control); and covers that provide indepth treatments of statistical theory and applications.

45-1 Introduction to Probability and Statistics

45-2 Business Statistics

45-3 Statistics for Technological Fields (e.g., Quality Control)

45-4 Advanced Statistics

45-1 INTRODUCTION TO PROBABILITY AND STATISTICS

These courses are designed to provide students with a basic understanding of statistical methods to facilitate study and research in other disciplines. Topics covered include summarization of raw data, probability, measures of central tendency, sampling, hypothesis testing, and univariate statistical tests.

45-2 BUSINESS STATISTICS

The emphasis of these courses is on the practical application of statistical techniques and methodology to business situations. Topics covered include measures of central tendency and variability, confidence intervals, hypothesis testing, and univariate statistical tests.

45-3 STATISTICS FOR TECHNOLOGICAL FIELDS

The emphasis of these courses is on the application of statistics to everyday problems that occur in engineering and industrial settings (e.g., quality control). Topics covered include fundamental concepts of statistics, control charts, acceptance sampling, product reliability, and statistical design of experiments.

45-4 ADVANCED STATISTICS

These courses are intended for students who need a more indepth treatment of statistics than that typically provided in an introductory course. Topics covered include: probability, central tendency and variability, inferential statistics, sampling, correlation and regression. The calculus is required as a prerequisite for entry into these courses.

46 COMPUTER SCIENCE AND TECHNOLOGY

This classification includes courses concerned with the understanding, use, programming, operation, and maintenance of computers of all types and sizes and in all fields. Courses that concentrate on calculating devices - such as the slide rule and the calculator - are also included in this classification.

46-1 Computer Courses for Non-Science Majors

46-2 Computer Programming

46-3 Math for computers

46-4 Technical Aspects of Computers

46-5 Calculators and Slide Rules

46-1 COMPUTER COURSES FOR NON-SCIENCE MAJORS

These courses are designed to provide students with a general understanding of computers and their uses in society. Topics covered include history of data processing, concepts, terminology, theory of modern computers, introduction to basic programming, and uses of computers in a modern technological society.

46-2 COMPUTER PROGRAMMING

These courses are designed to acquaint students with basic programming languages and to develop skills using one or more of these languages to solve problems in business, science, social science, and technological fields. Programming languages commonly taught include BASIC, Fortran IV, and APL. Students are usually required to write several programs as part of the course requirement.

46-3 MATH FOR COMPUTERS

This category includes courses concerned with the application of fundamental math processes to solving problems (in such areas as business, engineering, and math) using the computer. Topics covered include symbolic logic, the number system, set theory, Boolean algebra, and algorithms. These courses are typically designed for computer science majors.

46-4 TECHNICAL ASPECTS OF COMPUTERS

This category includes courses primarily concerned with the design,

operation, and maintenance of computers. Topics covered include systems operation, system construction, input-output devices, hardware, diagnostic testing, maintenance, and troubleshooting procedures.

46-5 CALCULATORS AND SLIDE RULES

These courses are designed to introduce students to the operation and use of the slide rule and the calculator. The emphasis of these courses is on how the slide rule and/or the calculator can be used as an aid to conducting mathematical computations. These courses generally carry only one or two credit hours.

50 THE PHYSICAL SCIENCES

Includes courses and programs dealing with the basic nature of matter and energy and associated phenomena in chemical, physical, geological, marine, astronomical, atmospheric, biological, environmental and other types of systems. More detailed description and analyses can be found in the further breakdown in each of the following classifications:

51 - Chemistry - Introductory

52 - Chemistry - Advanced

53 - Georgraphy

54 - Geology

55 - Other Earth & Space Sciences

56 - Physics

57 - Open

58 - Interdisciplinary Physical Science

59 - Environmental Sciences & Technologies

51 CHEMISTRY - INTRODUCTORY

Courses, generally completed during the first year, that introduce the student to chemistry and that deal with the structure, composition and properties of the various kinds of matter (substances), the changes occurring when various kinds of matter are brought together and subjected to various conditions, and the energy effects associated with such changes. These courses tend to be general in nature; may include material from several subdisciplines (e.g., inorganic, organic, analytical, physical and biochemistry), but may also be specialized in approach and selective in topics. The introductory courses tend to vary in content; level of chemical, physical and mathematical sophistication; and orientation because of the different needs, interests and backgrounds of the student groups for whom intended. These courses may rely heavily on laboratory work and prerequisites, especially mathematics, compared to other science courses. Courses related to two or more of the subcategories below (e.g., for preparatory and non-science students) were assigned to the one category most emphasized by the college in the catalog description. The seven subcategories described below are differentiated by either the educational goals or the preparation of the students for whom the included courses are intended.

51-1 Chemistry for Non-Science and Non-Technology Students

51-2 Chemistry for Allied Health and Other Biology Related Occupations

51-3 Chemistry for Engineering Technology and Related Occupations

51-4 Preparatory Chemistry

51-5 General Chemistry for Science and Engineering

51-6 Introductory Courses for Chemical Technology

51-7 Other Introductory Chemistry Courses

51-1 CHEMISTRY FOR NON-SCIENCE AND NON-TECHNOLOGY STUDENTS

The study of chemistry designed primarily for non-science and non-technology students, including liberal arts majors, to better acquaint them with the nature and fundamentals of chemistry as well as with chemical aspects of our physical environment and the relationship of chemistry to social, economic, and technological developments. These courses vary widely in the chemical topics included and often are thematically oriented (e.g., environment, life, history, etc.) They may be multifunctional, serving as the preparatory course (see 51-4), the chemistry course for technicians (see 51-3), and/or the whole or part of the chemistry requirement for allied health occupational students (see 51-2).

51-2 CHEMISTRY FOR ALLIED HEALTH AND OTHER BIOLOGY RELATED AND OCCUPATIONS

Courses included are designed primarily for occupational and transfer students in any of the allied health, agricultural, natural resources or similar programs. Includes the study of selected topics from inorganic chemistry, organic chemistry and biochemistry, with applications to living systems as encountered in advanced study or work in these fields. Courses for the occupational programs tend to be shorter; less intense; have lower prerequisites, if any; and are apt to be more specialized than those for the transfer students.

51-3 CHEMISTRY FOR ENGINEERING TECHNOLOGY AND RELATED OCCUPATIONS (Excluding Chemical Technologies)

Courses designed primarily for occupational and transfer students in any engineering technology, industry-related occupational, or similar programs (other than those that are chemically based). These courses include selected topics from inorganic and organic chemistry with applications to materials science and engineering related activities. Courses designed for a single program tend to be more specialized than those serving several curricula.

51-4 PREPARATORY CHEMISTRY

Includes courses to prepare students for other introductory chemistry courses, primarily the science majors course. Designed for students with no previous chemistry or weak chemical background whose educational programs require one of the other introductory chemistry courses or sequences. Generally includes an introduction to the principles of chemistry, including the modern concepts of atomic structure as a basis for understanding valence, formulas, equations, and chemical reactions and an emphasis on chemical calculations.

51-5 GENERAL CHEMISTRY FOR SCIENCE AND ENGINEERING

These courses satisfy the general chemistry, including qualitative analysis, requirements for students majoring in any of the physical or biological sciences, engineering or pre-professional health sciences programs. They include the study of the fundamental theory and principles

of atomic and molecular structure and chemical interactions as well as the chemical elements and their compounds. Also included are periodic relationships, acids and bases, physical states of matter, electrochemistry, oxidation-reduction, solutions, thermodynamics, kinetics, equilibrium, nuclear chemistry and an introduction to organic chemistry. The laboratory often includes qualitative analysis of common ions and elementary quantitative analysis techniques. These courses are generally organized into a one-year sequence and tend to rely heavily on prerequisites.

51-6 INTRODUCTORY COURSES FOR CHEMICAL TECHNOLOGY

Designed specifically for first-year students in chemical technology, chemical engineering technology, industrial chemistry or closely related occupational programs, these courses may include general chemistry (similar to 51-5) as well as orientation, introductory laboratory techniques and chemical calculations, organic chemistry, and industrial chemistry courses. They generally emphasize laboratory techniques, industrial chemistry and descriptive chemistry more and the theoretical aspects of chemistry less than the 51-5 courses.

51-7 OTHER INTRODUCTORY CHEMISTRY COURSES.

Courses for curricula or groups not covered above, such as fire science, police science, and printing. The content varies widely and is dependent upon the relationship of chemistry to the occupation.

52 CHEMISTRY - ADVANCED

Courses based on one or more terms of general chemistry for either science and engineering majors or chemical technology students and which deal with specialized areas of chemistry such as quantitative and instrumental methods of analysis, organic chemistry and biochemistry, chemical engineering and industrial chemistry, clinical chemistry and physical chemistry. These courses are intended primarily for students majoring in chemistry, biochemistry, chemical engineering, chemical technology and the biological and health sciences, including medical laboratory technology. Specialized courses not requiring general chemistry are included in the introductory category. The five subcategories described below are differentiated by content or specialized area.

52-1 Analytical Chemistry including Instrumental Methods

52-2 Organic Chemistry including Biochemistry

52-3 Industrial Chemistry and Chemical Engineering

52-4 Clinical Chemistry

52-5 Other Advanced Chemistry Courses

52-1 ANALYTICAL CHEMISTRY INCLUDING INSTRUMENTAL METHODS

The study of the theories, principles, and techniques of volumetric, gravimetric, and instrumental methods of analysis, including potentiometric, spectrophotometric, chromatographic and other modern methods, organized into courses such as quantitative analysis, instrumental methods of analysis courses and special techniques for environmental analysis (special techniques for clinical and industrial materials are included in 52-4 and 52-3 respectively).

52-2 ORGANIC CHEMISTRY INCLUDING BIOCHEMISTRY

The study of carbon containing compounds in terms of nomenclature, atomic and molecular structure, molecular geometry, stereochemistry, resonance, and reaction mechanisms to both aliphatic and aromatic compounds including the hydrocarbons, monofunctional and polyfunctional derivatives, carbohydrates and proteins. May include experiences in fundamental laboratory techniques and related theories, preparations, determination of properties, qualitative organic analysis and instrumental techniques. Also includes the study of the chemistry and metabolism of compounds of biological interest including the chemistry of the molecular components of the cells,

metabolism, biosynthesis and properties of proteins, DNA, RNA and molecular genetics. (Specialized courses such as physiological chemistry, nutrition, and pharmacology are included in the biological sciences.)

52-3 INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

The study of the industrial application of chemistry organized into courses such as industrial chemistry, analysis of industrial materials, unit operations, chemical process control and instrumentation, chemical engineering calculations. Also includes special courses related to petroleum, plastics, paint, which are based on the general chemistry course.

52-4 CLINICAL CHEMISTRY

The study of the theory and practice involving the qualitative and quantitative chemical analysis of biological fluids, especially human. Includes analysis for carbohydrates (e.g., glucose), enzymes, proteins, lipids, etc. as well as gastric analysis for the stool, urine, and serum contents. Emphasis is placed on such instrumental methods as flame photometry, spectrophotometry, electrophoresis, fluoresence, microgasometry, chromatography, and potentiometric techniques. May also include automated techniques and radioisotope methods.

52-5 OTHER ADVANCED CHEMISTRY COURSES

Includes other chemistry courses following general chemistry such as physical chemistry.

53 GEOGRAPHY

Includes courses and programs dealing with the study of the surface of the earth; its division into continents and countries; and the climate, plants, animals--including humans, natural resources, inhabitants, and industries of the various divisions. Categories include physical, cultural, economic, and environmental geography as well as regional geography on any scale, local to world. Also includes all courses in the curriculum such as cartography, photogrammetry, topographic mapping, and noncelestial navigation which consider the preparation or interpretation of maps or aerial photographs.

53-1 Introductory and General Geography

53-2 World and Regional Geography

53-3 Physical Geography

53-4 Cultural Geography

53-5 Economic and Political Geography

53-6 Environmental Geography

53-7 Cartography, Photogrammetry, and other Map Related Courses

53-8 Other Geography Courses

53-1 INTRODUCTORY AND GENERAL GEOGRAPHY

The study of geography as a field combining significant ideas from physical, cultural and economic geography. Includes both introductory courses designed for general students and principles courses, which integrate topics from the various subdisciplines of geography for students majoring in a social or earth science or closely related field.

53-2 WORLD AND REGIONAL GEOGRAPHY

The study of various regions including the geographical environment, human activities, land use patterns, resource appraisal and problems of physical, cultural, political and economic differences. Includes courses that study the whole world, a major region of the world, the United States, a region of the U.S., a state, a local region, and the national parks. Courses are designed for students majoring in a social science, earth

science, or regional studies program, or students who have a special interest in the region.

53-3 PHYSICAL GEOGRAPHY

The study of the physical features of the earth, including earth-sun relations; maps; elements and controls of climate; landforms, erosion, and deposition; water resources; vegetation associations; and soil types. Most courses are designed for majors in an earth science or social science, however, many such courses are used by others to satisfy a general education requirement.

53-4 CULTURAL GEOGRAPHY

The study of the cultural elements of the earth including population distribution, settlement types and patterns, land and resource utilization, transportation and commerce. Major subgroups are cultural and human geography but historical and population geography are also included. Most courses are designed for majors in a social science or an earth science or to satisfy a general education requirement.

53-5 ECONOMIC AND POLITICAL GEOGRAPHY

The study of the principal world economic activities from a geographical viewpoint, including the national and international utilization of natural resources, manufacturing, trade, and transportation and related cultural and natural factors. Also includes the political view of geography. Most courses are designed for majors in a social science or business related field.

53-6 ENVIRONMENTAL GEOGRAPHY

Study of the patterns and forms of mankind's changing use of and adjustments to the earth's environments. Also includes urban and rural geography: the study of the sociological, psychological, and economic forces at work in urban or rural places from a spatial, geographic perspective.

53-7 CARTOGRAPHY, PHOTOGRAMMETRY AND OTHER MAP RELATED COURSES

The study and utilization of maps and charts including the theory and fundamental techniques of compiling, delineating, and reproducing cartographic components, considering layout, design and symbolization; and cartographic drafting and lettering techniques using a variety of media and materials. Includes photogrammetry, the process of making maps or scale drawings by aerial or other photography, and topographic mapping, the art of graphically representing on a map the exact physical configuration of a place or region. Also includes the interpretation of maps, aerial photos, topographic maps and similar materials and the use of maps in navigation. Includes introductory courses in these fields and specialized courses for environmental science, forestry, civil engineering, military science and related technology students.

53-8 OTHER GEOGRAPHY COURSES

Includes courses not easily placed above such as travel geography courses designed primarily for travel industry students, place name geography, and geographical analysis.

54 GEOLOGY

Includes courses and programs dealing with the history of earth and its life, especially as recorded in rocks, and encompassing the structure, composition, origin, distribution and modification of materials upon and within the earth. Also includes the application of chemical, physical, mathematical and engineering principles to the exploration for and extraction of economically important minerals from the earth. Classification into the categories is based on whether the course is general in nature, regional or environmental in approach, physical or historical in emphasis, or is primarily concerned with a specific subdiscipline of geology such as mineralogy, paleontology, or geomorphology.

54-1 Introductory and General Geology

54-2 Regional and Field Geology

54-3 Physical Geology

54-4 Historical Geology

54-5 Mineralogy

54-6 Paleontology

54-7 Environmental Geology

54-8 Geomorphology

54-9 Other Geology Courses

54-1 INTRODUCTORY AND GENERAL GEOLOGY

The study of geology as a field combining significant ideas from physical and historical geology such as an introduction to the materials, structures and processes (e.g., vulcanism, earthquakes, erosion) at work on and within the earth as indicated by the rock and fossil record. Includes introductory courses designed for general or technology students as well as the principles courses, which integrate topics from the various subdisciplines of geology.

54-2 REGIONAL AND FIELD GEOLOGY

The study of the physical and historical geology of a given geographical (e.g. California) or geological region (e.g. the Great Basin Province) including the geomorphology and geological record. Includes some locally oriented courses and others dealing with national parks as well as fields geology courses. Courses are generally designed for students with a specific interest in the subject or region, rather than to satisfy the science requirement for general education or meet a specific requirement for a science or technology major.

54-3 PHYSICAL GEOLOGY

The study of materials and structures of the earth, rocks and their mineral composition; agents of erosion (rivers, winds, glaciers); and forces of change (volcanoes, earthquakes). May include experience with minerals, rocks, earth structures and topographic map interpretation. Most courses are designed for majors in geology or related fields; however, many such courses are used by other students to satisfy a general education requirement. Includes physically oriented courses designed for engineering, forestry, and technology students.

54-4 HISTORICAL GEOLOGY

The study of the geologic history of the earth and its inhabitants as indicated by the rock and fossil record. May include experience with fossil life, stratigraphy and sedimentation. Most courses are designed for majors in geology or related fields; however, some such courses are used by other students to satisfy a general education requirement.

54-5 MINERALOGY

The study of inorganic substances (e.g. ores) and some of organic origin (e.g. coal and petroleum) occurring naturally in the earth, including their physical properties (color, hardness, crystalline structure, etc.) and their chemical composition. May include experience in location and identification of ore minerals and gemstones. Includes courses designed for science and specific technology majors as well as those designed for students with an avocational type interest in rocks and minerals. Science and technology courses in this category often have some combination of chemistry, physics and geology prerequisites whereas the interest centered courses do not.

54-6 PALEONTOLOGY

The study of the prehistoric forms of life through the study of plant and animal fossils including the morphologic, systematic, and ecological aspects of invertebrate fossils and the uses of fossils in stratigraphic work.

54-7 ENVIRONMENTAL GEOLOGY

The study of the interrelationships between geologic processes, earth materials and man including such topics as geologic hazards (landslides, mudflows, earthquakes, etc.), environmental impact of mineral extraction, mineral resources, and geologic problems related to massive urbanization.

54-8 GEOMORPHOLOGY

The examination of world land-forms and an analysis of their origins and nature, with emphasis on the processes relating to their development and on their environmental implications.

54-9 OTHER GEOLOGY COURSES

Includes courses not easily placed above such as geophysics.

55 OTHER EARTH AND SPACE SCIENCES

Includes courses and programs concerned with a descriptive study of the heavenly bodies, the atmosphere of the earth and the oceans and other natural bodies of water as well as interdisciplinary studies involving any combination of the disciplines of astronomy, geography, geology, meteorology, and oceanography. Also includes courses which emphasize the application of chemistry, physics, and mathematics to an understanding of the heavenly bodies, the atmosphere and the oceans and technology courses closely related to those sciences. Categories include astronomy, meteorology and climatology, oceanography and limnology, plus an interdisciplinary earth-space science grouping.

55-1 Interdisciplinary Earth and Space Science

55-2 Astronomy

55-3 Meteorology and Climatology

55-4 Oceanography and Limnology

55-1 INTERDISCIPLINARY EARTH AND SPACE SCIENCE

The interdisciplinary study of materials, energy and resources in the areas of geology (the solid earth and its interior), meteorology and climatology (the atmosphere), oceanography and limnology (the hydrosphere), geography (the environment of the earth in space and time) and astronomy (the solar system and other heavenly bodies). Primarily includes introductory courses for non-science majors with a wide variety of combinations of the above disciplines found in the courses.

55-2 ASTRONOMY

The study of the heavenly bodies (fixed stars, satellites, planets and comets), their nature, distribution, magnitudes, motions, distances, periods of revolutions, ellipses, composition, etc. Includes both the descriptive type introductory courses for non-science majors and courses concerned with the application of the principles of physics, chemistry and mathematics to the study of the heavenly bodies. Separate observation and instrumentation courses and celestial navigation courses are included, as are cosmology and extraterrestial life courses. These courses are intended primarily for non-science majors and students with strong interests in these areas but are not part of an astronomy major.

55-3 METEOROLOGY AND CLIMATOLOGY

The study of the earth's atmospheric phenomena, involving the analysis of weather variations and the regional distributions of climates over the surface of the earth. Includes primarily introductory courses for non-science majors although some specialized aviation weather courses are included.

55-4 OCEANOGRAPHY AND LIMNOLOGY

The study of the oceans (oceanography) and bodies of fresh water (limnology) including the chemical and physical properties and processes of seawater and fresh water bodies and the water masses, circulation and measurement techniques. Includes both the descriptive type introductory courses for non-science majors and courses concerned with the application of the principles of physics, chemistry and mathematics to the study of these bodies of water. Separate field and instrumentation courses and marine technology courses are included. Although some courses include selected biological topics, courses that are primarily marine biology are placed in the 28 series. These courses generally lack prerequisites unless they emphasize the application of scientific principles, field measurement and evaluation, or marine technology.

56 PHYSICS

Includes courses and programs concerned with the properties and interaction of energy and matter and with the fundamental concepts involved in physical phenomena as well as those which provide experience in interpreting the physical world. Courses, often combined into sequences, include some combination of mechanics of solids and fluids, heat, sound, optics - geometrical and physical, wave motion, electricity, magnetism, atomic and nuclear physics, and other modern physics topics such as relativity, plasma, lasers, etc. Many sequences deal with all, or most of, the above topics, but are differentiated because they vary in the total time required and in the mathematics used for analysis. Further differentiation is by the groups of students served, a primary criteria in establishing the categories for physics courses. Categories are provided for physics courses based on the calculus, primarily for physical science and engineering majors; for general physics courses based on trigonometry and algebra, designed for biology, health science, and other science related students; technical physics courses serving the engineering technologies, industrial technologies and the trades; and for those courses oriented towards allied health occupations or other biology related occupations. Separate categories are also included for the more descriptive, non-science major type course, for preparatory courses and for coursed which do not fit a specific category. Most physics courses include laboratory experience and mathematical prerequisites.

56-1 Physics for Non-Science and Non-Technology Students

56-2 Physics for Allied Health and other Biology Related Occupations

56-3 Physics for Engineering Technology and Related Occupations.

56-4 Preparatory Physics Courses

55-5 General Physics (Non Calculus)

56-6 Other Non Calculus Physics Courses

56-7 Engineering and General Physics Calculus based

56-1 PHYSICS FOR NON-SCIENCE AND NON-TECHNOLOGY STUDENTS

Includes those course which provide a descriptive introduction to the fundamental concepts of physics including work and energy; heat, sound, light and electrical energy; energy of motion and molecular energy. These courses are designed primarily for non-science and non-technology students and require little, if any, mathematical background. Some courses deal primarily with the physical concepts related to energy or the environment. Others are designed for specialized groups such as education or music and speech (in which sound and acoustics are the focus).

56-2 PHYSICS FOR ALLIED HEALTH AND OTHER BIOLOGY RELATED OCCUPATIONS

Includes courses designed primarily for the non-transfer allied health occupational students. Many such courses include selected topics from the major areas of physics (solid mechanics, fluid mechanics, heat, sound, electricity, magnetism, electromagnetic radiations, and atomic and nuclear physics) which have particular applications in the human health sciences. Other courses are more limited with respect to the included physical topics and the health or biological application because they serve specific groups such as radiological technicians, respiratory therapists or optical technicians.

56-3 PHYSICS FOR ENGINEERING TECHNOLOGY AND RELATED OCCUPATIONS

Includes technical physics and other courses designed primarily for occupational and transfer students in any of the engineering technology, industrial technology or related trades programs. These courses include the study of slected topics from the major areas as in the allied health category but with particular applications in engineering and materials systems. This category also includes more specialized courses for groups such as electronics, fluid-related technologies, construction occupations or fire science students.

56-4 PREPARATORY PHYSICS COURSES

These courses are for the underprepared student pursuing an educational goal which requires one of the general physics sequences, technical physics or, less frequently, an allied health physics course. Underprepared students characteristically have no previous physics or weak physics, mathematics, or problem solving backgrounds and these courses emphasize the fundamentals of physics or the solving of typical physics problems analytically, or both. This category also includes problem solving courses taken concurrently with a general, calculus or non-calculus, or technical physics course.

56-5 GENERAL PHYSICS (NON CALCULUS)

The courses in this category involve characteristically, a one-year study of the fundamental theories and principles of physics associated with the mechanics of solids and fluids, heat, sound, electricity, magnetism,

electromagnetic radiations, and atomic and nuclear physics. This study is generally based on mathematics through intermediate algebra and often trigonometry. These courses are requirements for transfer biological and health science students (unless the calculus course is required) as well as for earth science, architecture, and industrial and engineering technologies (when a comparable technical physics course is not available).

56-6 OTHER NON-CALCULUS PHYSICS COURSES

These courses serve curricula or purposes other than those in categories 56-1 through 56-5. Examples include radiation physics and optics for non-allied health groups; the Malmstead-Enke type electronics for scientists courses; and non-calculus based modern physics based on the general physics course.

56-7 ENGINEERING AND GENERAL PHYSICS (CALCULUS BASED)

This category includes the study of mechanics of solids and fluids; heat; sound; electricity and magnetism; geometrical, wave and quantum optics; and modern physics organized into a one to two-year sequence of courses emphasizing the fundamental theories and principles of physics using the calculus as a basis for analysis and problem solving. There are two, three and four semester and three, four and five quarter sequences, therefore, the content arrangement among the individual courses varies widely as do the lecture and laboratory hours per week and units. These sequences require completion of or concurrent enrollment in the first calculus course for the first physics course and often add calculus courses as pre or co-requisites to the sequential physics courses. The engineering physics courses are designed primarily for physics, chemistry, engineering and mathematics majors. The category also includes calculus based courses for biological and health science students and for some of the more sophisticated engineering technology programs.

58 INTEGRATED SCIENCES

Courses within this category combine two or more specialized areas of science and serve as an introduction or survey of the sciences for general education students and/or students entering career programs. Specialized areas include chemistry, physics, geology, astronomy, and other physical sciences, as well as certain biological topics. Courses covering scientific measurement, science teaching methods, and forensic science also fall within this category.

- 58-1 Integrated sciences for non-science majors
- 58-2 Physical science surveys
- 58-3 Science for allied health occupations
- 58-4 Science for engineering and industry-related technologies
- 58-5 Measurement and metrics
- 58-6 Science teaching methods
- 58-7 Forensic science
- 58-8 Preparatory and special courses for science majors
- 58-9 Other general science courses

58-1 INTEGRATED SCIENCES FOR NONSCIENCE MAJORS

Courses provide a broad perspective of scientific concepts for non-science majors fulfilling general education science requirements. Courses include a combination of topics from the biological and physical sciences and may emphasize the interrelationship among the scientific disciplines. Courses preparing students for the GED examination and developmental science courses are also included.

58-2 PHYSICAL SCIENCE SURVEYS

Courses for non-science majors treat some combination of physics, chemistry, geology, astronomy, and/or other earth and space sciences. Courses may have a thematic orientation such as the impact of physical sciences on man and on everyday life or the physical sciences from a Biblical point of view.

58-3 SCIENCE FOR ALLIED HEALTH OCCUPATIONS

Basic physical science and/or biological science courses designed for allied health occupational students comprise this category of courses. Courses include scientific topics and mathematical concepts which relate to the body, prevention and control of disease and infection, and general hospital situations. Courses may be designed for the allied health occupations generally or for a specific health technology program, such as nursing or respiratory therapy.

58-4 SCIENCE FOR ENGINEERING AND INDUSTRY-RELATED TECHNOLOGIES

Courses treat two or more of the physical sciences and relate to engineering and industry-related technologies generally or select those physical science topics of particular interest to a given technology. Examples include fire science, science of photography, and color theory, presenting the physics, physiology, and chemistry of color for interior design majors.

58-5 MEASUREMENT AND METRICS

Courses present the metric system as it applies to the needs of technological programs or everyday life. Courses cover such concepts as area, volume, temperature, and conversions from the English system. Measurement courses such as basic review of measurement or measurement systems which apply to the treatment of scientific data also fall within this category.

58-6 SCIENCE TEACHING METHODS

Courses designed for prospective teachers provide scientific (and mathematical) concepts, materials, techniques, and experiences that can be used to teach and stimulate interest in science for preschool and elementary school children. Laboratory and field experiences may be included. Courses may also cover science and/or mathematics teaching methods.

58-7 FORENSIC SCIENCE

Courses examine the physical and chemical tests used in the crime laboratory as part of administration of justice programs. Courses cover the use of the laboratory for microscopic and chemical analysis, and photographic techniques in identifying and comparing physical evidence. Demonstrations and laboratory experiments may be included.

58-8 PREPARATORY AND SPECIAL COURSES FOR SCIENCE MAJORS

Courses which present techniques and concepts from two or more sciences, or mathematics, designed to prepare students for advanced science courses. This category also includes special courses cutting across scientific disciplines such as applied math and statistics, concepts of the science lab, data collection techniques, glassblowing (for scientific glass), scientific photography, and the use of scientific materials.

58-9 OTHER GENERAL SCIENCE COURSES

Courses deal with general scientific topics such as the scientific aspects of energy, consumer science, the introduction to basic scientific products, and the future advances of science. Such courses are usually general interest courses and do not serve as requirements for any specific career program or science major.

59 ENVIRONMENTAL SCIENCE

These are environmental science courses both for general education students and students in environmental or related technologies. Both general survey courses and courses examining specific environmental issues (e.g., air, water, and noise pollution) and the identification and prevention of environmental problems form this category. Courses in the technological curricula dealing with personnel and facility management are not included.

- 59-1 Environmental science for non-science and non-technology majors
- 59-2 Environmental technology
- 59-3 Air pollution
- 59-4 Water pollution
- 59-5 Noise pollution
- 59-6 Solid waste disposal
- 59-7 Nuclear radiation control
- 59-8 Agricultural pollution
- 59-9 Other environmental studies

59-1 ENVIRONMENTAL SCIENCE FOR NON-SCIENCE AND NON-TECHNOLOGY MAJORS

These courses provide a general overview of the environmental and natural resources on a global, national or regional basis, primarily for non-science majors. Man and environment courses examine how man interacts with the environment through the study of human population, food and energy resources, pollution and its control, the impact of social structures and technology, and urban and suburban growth.

59-2 ENVIRONMENTAL TECHNOLOGY

These courses are designed for students in environmental science and technology or related majors. These introductory or survey courses deal with all types (air pollution, water analysis and treatment, etc.) of environmental problems. General studies of environmental resources, sources and control of pollution, occupational hazards and safety, instrumentation and measurement of environmental conditions and governmental regulations are also included.

59-3 AIR POLLUTION

The courses examine the sources, classes, measurements and metereology of air pollution. Topics include the effects of air pollution on health, animal and plant life as well as the means of prevention and control. Also included are courses dealing with specific air pollution problems and methods of control such as mine ventilation. Includes courses primarily designed for environmental and other technology programs.

59-4 WATER POLLUTION

The courses deal with the environmental aspects of water, including water sources, distribution and use, and waste water disposal. As part of water technology career programs, courses include water analysis and treatment and waste water treatment, including studies of instrumentation used for analysis and treatment. Field trips and laboratory time are often included.

59-5 NOISE POLLUTION

The study of the physics of noise, biological effects of noise, and instrumentation for noise evaluation, especially within occupational environments, designed for industrial or environmental technology or related programs.

59-6 SOLID WASTE DISPOSAL

The scientific aspects of solid wastes, including the study of classes and sources of solid waste together with methods of handling, storage, and disposal provide the content for these technical career courses.

59-7 NUCLEAR RADIATION CONTROL

These courses deal with the methodology for evaluating radiation and radiation contamination control and protection of personnel. Courses are included within industrial or environmental technology programs.

59-8 AGRICULTURAL POLLUTION

The courses examine sanitation problems related to soil and food, including pesticides and other chemical problems, milk and food processing, and insect and rodent control. These courses may be part of an environmental or health technology program or they may serve to stimulate general community awareness.

59-9 OTHER ENVIRONMENTAL STUDIES

These courses deal with other environmental problems and the control or prevention of such problems assigned for students within technology programs.

60 SOCIAL AND BEHAVIORAL SCIENCES

Includes courses and programs having to do with all aspects of the past and present activities, conduct, interactions, and organizations of humans. More detailed descriptions and analyses can be found in the further breakdowns in each of the following classifications:

61 - Anthropology

62 - Psychology

63 - Sociology

64 - Economics

65 - Open

66 - Open

67 - Interdisciplinary Social and Behavioral Sciences

68 - History, Sociology, and Philosophy of Science

61 ANTHROPOLOGY

This category includes courses and programs dealing with the study of the physical, social and cultural origins of man. The discipline focuses on the inter-relationship of the natural and social environment as it relates to behavior patterns, social institutions, language, and beliefs among different cultures. The categories are physical, cultural, prehistory and archaeology, Indian and Native American, specialized cultural, and specialized topics. Unless otherwise stated, these courses are designed for students who wish to fulfill a general education requirement and for students who wish to pursue a program in anthropology or another social science.

61-1 Introductory-General

61-2 Physical Anthropology

61-3 Cultural Anthropology

61-4 Archaeology/Prehistory

61-5 Indian and Native American

61-6 Specialized Cultural

61-7 Other

61-1 INTRODUCTORY-GENERAL

This category includes those courses that introduce the study of anthropology as a field. The basic principles and topics from physical anthropology, cultural anthropology, archaeology, and ethnology are presented to give students an integrated overview of various subdisciplines within anthropology.

61-2 PHYSICAL ANTHROPOLOGY

The courses emphasize the biological aspects of human development. Topics include man's evolution in terms of his place in nature, the historical development of life, classification and distribution of the races of mankind, and the nature and significance of human biological variation.

61-3 CULTURAL ANTHROPOLOGY

The courses examine the various designs for living which men in different parts of the world and in different times have developed to satisfy their biological, social, and psychological needs. Topics focus on the uniformities and variabilities of social and cultural life as seen through social organization, family structure, religion and language among contemporary, preliterate, peasant, and urban societies.

61-4 ARCHAEOLOGY/PREHISTORY

These courses cover the historical development, the theory, and the techniques of archaeology and the development of prehistorical cultures as revealed through the excavation and analysis of their material remains. Many of the classes are oriented toward the practical application of archaeological methods and include archaeological site visitations and field and/or lab work. These classes sometimes have prerequisites and are intended for students who have more background in anthropology.

61-5 INDIAN AND NATIVE AMERICAN

Courses in this category deal with the origins and migrations of early man in the New World, his life and customs prior to the arrival of the Europeans, the impact of Westernization on his culture, and his contemporary problems. Cultures of North American tribes, South American tribes, and tribes that are indigenous to a specific locale such as California or the Pacific Northwest are included here.

61-6 SPECIALIZED CULTURAL

These courses include the study of specific cultures both within the U.S. and in other areas of the world and the study of specific cultural topics such as myth, folklore, religion, cultural communication systems, and culturally determined sex roles. These classes tend to deal with the topics under examination in greater depth in comparison to courses in 61-3.

61-7 OTHER

Includes courses not easily placed in other categories such as principles and techniques of developing and running a museum, medical anthropology, and ethno-psychiatry.

62 PSYCHOLOGY

Includes courses and programs having to do with the nature, functions, and capabilities of the mind (feelings, needs, desires) and the scientific study of human behavior. Courses which note the personal relevancy of psychological theories are included, but courses which have personal growth or adjustment, or college and career orientation, as their primary focus are not included.

62-1 Elementary

62-2 General

62-3 Developmental

62-4 Abnormal

62-5 Social/Industrial

62-6 Personality and Psychology of Adjustment

62-7 Experimental

62-8 Educational

62-91 Contemporary Issues

62-99 Physiological

62-1 ELEMENTARY

General principles of psychology as they apply to everyday life. Courses which meet the criteria for General Psychology except for one or more of the following points were classified as Elementary: (1) the course is not a prerequisite for any other courses; (2) practical applications are stressed more than theory; (3) the school's curriculum includes a more intensive general psychology course (except where the more intensive course is specifically designated as advanced or honors psychology); (4) the course is specifically designed for non-social science majors; or (5) it is a one semester, terminal course. Courses in college orientation are not included.

62-2 GENERAL

A broad overview of the general field and fundamental principles of psychology. In most cases this course is used as the prerequisite for further courses

in the field. General courses emphasize the theoretical aspects of psychology. In some cases this course is offered in a year-long series of classes. Advanced or honors sections in general psychology are included in this category.

62-3 DEVELOPMENTAL

The study of the emotional, intellectual, social and physical development of the individual. Courses in this category may concentrate on a specific period of the human life-span (e.g., Child Development, Adolescent Psychology) or may cover the entire developmental process--birth through death. Societal standards of "normal" development may be considered, but courses stressing the development of deviant behavior are classified as Abnormal (62-4). Developmental courses are found not only in the psychology curricula, but may be taught in allied health programs for health technicians or nurses, or education and early childhood education programs for parents and teachers.

62-4 ABNORMAL

The study of the etiology, symptoms, and therapeutic approaches for treatment of organic and functional disorders. May include courses dealing with mental retardation, giftedness, social maladjustment, emotional disturbance, and other behavioral anomalies. In some cases this course may be an elective for social science students, but it is generally directed towards psychology students and those in health and education programs.

62-5 SOCIAL-INDUSTRIAL

The study of the individual which focuses attention on the interaction of internal and social processes as they relate to human behavior in general as well as in the work setting. Includes topics such as social perception, group and intergroup processes and social patterning. In addition to courses entitled Social Psychology and Industrial Psychology, this category includes Organizational Psychology, and Psychology for Supervisors. Courses of this type that are offered within the sociology department are included in this category. Although most courses within this group are college transfer courses in the psychology department, some courses are directed towards business personnel.

62-6 PERSONALITY AND PSYCHOLOGY OF ADJUSTMENT

Study of the ways personalities develop and change, often with an emphasis on the ways in which people adjust to their environments. Investigate topics such as emotions, reactions to frustration, individual differences, mental health principles, sexual adjustment, and current theories of personality. These courses are offered as a part of the psychology curriculum but may satisfy general education requirements. Courses which focus on the personal growth of the student and group counseling experiences are not included if they do not have a General Psychology prerequisite.

62-7 EXPERIMENTAL

A methodology course designed to introduce students to the fundamentals of behavioral research. Principles of experimental design and analysis. Usually has a general psychology prerequisite, and some call for a background in statistics. Intended for the college transfer psychology major.

62-8 EDUCATIONAL

An introduction to the basic principles of psychology that are pertinent to education, including intelligence, social and emotional factors, and basic learning theories. May include principles and problems of testing and evaluation. Course is usually designed for teachers, prospective teachers, or psychology majors.

62-91 CONTEMPORARY ISSUES

Courses that investigate current issues in society that stress the theoretical application of psychology to these areas. Examples of courses in these areas include Psychology of Women, Social Psychology of Ethnic Minorities, Black Psychology, Human Sexual Behavior, Psychology of Contemporary Social Issues, and Psychological Foundations of Racism and Sexism. These tend to be general interest courses open to the entire college community, though occasionally they have a General Psychology prerequisite.

62-99 PHYSIOLOGICAL

Study of human behavior from a physiological point of view. An advanced level course designed for psychology majors and college transfer students who meet course prerequisites. Includes study of central nervous system, as well as examination of other areas dealing with the relationship between biological systems and behavior.

63 SOCIOLOGY

Includes courses and programs that study the development, structure, interaction, and collective behavior of groups of individuals, and the analysis of social institutions. Courses may incorporate the personal relevancy of sociological principles and theory, but courses that have as their primary focus personal applications, human relations skills, or counseling skills are not included. Field practicum and independent study courses are also not included because it is impossible to evaluate the actual scientific content of these courses.

63-1 Introductory

63-2 General/Principles

63-3 Social Problems/General

63-4 Marriage and Family

63-5 Social Institutions

63-6 Social Problems/Specific

63-7 Social Institutions/Specific

63-8 Sociology of Group

63-9 Other

63-1 INTRODUCTORY

A general course in sociological theory. Similar to courses described as General/Principles (63-2) except that Introductory courses meet one or more of the following criteria: (1) the course is not a prerequisite for any other course(s); (2) it is the only sociology course in the college's curriculum; (3) practical applications are considered as much as theory; (4) the college's curriculum includes a more intensive general sociology course; (5) the course is specifically designed for non-majors; or (6) it is a one semester, terminal course.

63-2 GENERAL/PRINCIPLES

A general introductory course designed to familiarize the student with the basic sociological concepts, theories, and methods. Although the course is most commonly a part of the required curriculum for social science majors, it is also a suggested elective or required course in a wise range of non-social science major fields, including some vocational and technology oriented courses of study.

63-3 SOCIAL PROBLEMS/GENERAL

Courses utilizing sociological concepts and methods in the investigation and analysis of major social problems, including methods for alleviating social problems. Courses that concentrate on a single problem (e.g., delinquency) are classified as Social Problems/Specific (63-6).

63-4 MARRIAGE AND FAMILY

A sociological analysis of the family and its forms and functions. The course typically analyzes marital practices and family structures in a variety of cultural settings, and may investigate the extent to which societal customs and mores affect the individual's conceptualization of these areas. Courses that primarily emphasize the student's personal feelings and thoughts about marriage and family, or courses intending to provide a framework for a "successful" marriage, are not included. Usually offered as a social science elective by sociology department, but these courses are sometimes offered through the home economics department.

63-5 SOCIAL INSTITUTIONS/GENERAL

The study of a variety of social institutions, usually focusing on theoretical and cross-cultural perspectives of education, religion, and the family. Courses that focus on a single social institution are categorized under either Marriage and Family (63-4) or Social Institutions/Specific (63-7).

63-6 SOCIAL PROBLEMS/SPECIFIC

The study of the sociological bases of specific problems in our society (e.g., crime, delinquency, drugs, alcohol, cities, overpopulation). Classes directed specifically towards law enforcement personnel, classes that focus primarily on the treatment of a problem (e.g., juvenile corrections, drug counseling), and classes that are geared towards informing the student about the personal dangers of a problem (e.g., drug abuse) are not included. Law enforcement classes that use a sociological perspective to investigate a problem and are open to the general student body (e.g., criminology) are included.

63-7 SOCIAL INSTITUTIONS/SPECIFIC

The study of a single social institution (e.g., religion, education, medicine) and the social factors that effect groups and individuals interacting within these institutions. The institution of family is widely studied, and hence is categorized separately under Marriage and Family (63-4)

63-8 SOCIOLOGY OF GROUP

Most courses in this category are concerned with presenting a sociological perspective on a particular minority group or groups in our culture (e.g., Sociology of Women, Sociology of the Black American, Sociology of Native Americans). Courses in this category may also concentrate on the sociological processes involved in group behavior in general.

63-9 OTHER

Courses in sociology that do not fit any of the preceding categories (e.g., Sociology of Consumer Behavior, Sociology of the Small Town in America, Social Aspects of Deafness, American Society).

64 ECONOMICS

Includes courses and programs dealing with the production, distribution, and consumption of wealth. Offerings focus on economic principles, problems, issues, and institutions as they pertain to individuals, business firms, the government, and other nations. Economic courses from business (e.g., money and banking, real estate economic); agriculture (e.g., Agriculture Economics), engineering (e.g., Engineering Economics), and history, (e.g., Economic History of the U.S.) are included in this classification.

64-1 Introductory/General Economics

64-2 Principles of Economics

64-3 Business-Related Economics

64-4 Technology Related

64-5 American History and Economy

64-6 Special Topics

64-1 INTRODUCTORY/GENERAL ECONOMICS

This category is comprised of non-technical, non-theoretical introductory survey courses of economic principles, problems, institutions, and issues as they pertain to individuals, business firms, and the nation. Among the topics covered in these courses are supply and demand, finance, and money and banking, national income, economic growth, income distribution, unemployment, poverty, inflation, labor unions, and foreign trade. These courses assume no previous study in economics and are generally designed for students who are not business or economic majors.

64-2 PRINCIPLES OF ECONOMICS

Courses in this category focus on the principles of economics and the bearing of these principles on the economy. Topics related to macroeconomics and microeconomics are often covered in separate courses, with the former typically offered before the latter. Among the topics discussed in the Principles Courses are economic analysis, institutions and policy issues; price systems; distribution of income; money and banking; national income; and public finance. The Introductory Principles course often serves as a prerequisite for more advanced courses in economics.

64-3 BUSINESS-RELATED ECONOMICS

This category includes courses in money and banking, real estate economics, labor economics, insurance economics, and business economics. The courses are usually offered by business departments and the emphasis is on the application of economic principles to the study of business-related concerns. Introductory courses in business and, to a lesser extent, economics often serve as prerequisites for enrollment in these classes.

64-4 TECHNOLOGY-RELATED

Consists primarily of courses in agriculture economics and, to a much lesser extent, courses in engineering, industrial, and transportation economics. These courses are designed to help students apply general knowledge and theory of economics to problems related to their industry. Topics covered in agriculture economics include production, value, prices, credit, land tenure, marketing, and international trade. Engineering economic courses typically include such topics as investment, financing, depreciation, manufacturing, costs, and replacement analysis. These courses are offered by technology divisions and do not usually require previous course work in economics.

64-5 AMERICAN HISTORY AND ECONOMY

These courses focus on the institutional, technological, and economic conditions that have influenced economic growth and development in the U.S. or in a particular region of the country from the colonial period to the present. Generally included are factors that have influenced the growth of American economic institutions (business, industry, agriculture, transportation, financial) and the affects of these changes on contemporary American life. These courses are often offered by a history department or social science division and, in many institutions, may be used to satisfy a history and/or American government graduation requirement.

64-6 Special Topics

Courses in economics that do not fit in any of the preceding economic categories. This category includes courses in comparative economic systems, economic development and issues of specific countries and regions of the world. Also included in this category are courses that examine economic problems of a particular group (e.g., women; Blacks) as well as courses focusing on contemporary economic issues.

67 INTERDISCIPLINARY

This category includes courses and programs that combine two or more special areas of social science (anthropology, psychology, sociology, economics, history, political science and georgraphy) or occasionally combine a social science and a biological science, i.e., biology or ecology. These courses and programs deal with some aspect of the past, present, and future activities, institutions, and behavior of humans. Unless otherwise stated such courses and programs serve as a introduction or survey to the social science disciplines for general education students or students entering career programs.

67-1 Social Science

67-2 Environmental

67-3 Aging

67-4 Special Groups

67-5 Social Research

67-6 Thanatology

67-7 Urban Planning

67-9 Other

67-1 SOCIAL SCIENCE

A study of man in the modern world employing a conceptual approach that utilizes topics from the various social science disciplines. The major emphasis is on the American experience and American institutions. The format varies from a single course to a two or three course sequence most frequently offered under the heading Social Sciences. Such courses are also offered under Basic Education and GED.

67-2 ENVIRONMENTAL

A study of the basic concepts in human, cultural, and social ecology. Courses cover such topics as populations, communities, ecosystems, resource utilization and modeling, regulatory mechanisms in ecosystems and the consequences of their disturbances.

67-3 AGING

A study of aging offered by many different departments and from a variety

of perspectives. Among these are psychology, sociology, biology, nursing, and human services. Topics include the physical, psychological, emotional, and role changes involved in the aging process; issues relevant to older adults such as economics, housing, legislation, community resources, etc.; and resocialization techniques needed to help the older adults deal with changes that accompany senescence.

67-4 SPECIAL GROUPS

A study of special groups, such as ethnic minorities, women, and the physically handicapped. The interdisciplinary approach provides several perspectives from which to examine how the group views itself, problems that are unique to the group, and the relationship and interaction between the particular group and other segments of the society.

67-5 SOCIAL RESEARCH

The study of the methods and procedures of research that are appropriate to social science. Courses include research design, interpretation of data, and applications of social research.

67-6 THANATOLOGY

A study of death and dying offered from the perspective of a number of different disciplines. Topics covered in these courses are: perception of death in Western society in comparison with perceptions from other societies, learned attitudes towards death, euthanasia, social rituals and taboos, the grief process, children and death, and personal examination of feelings and attitudes about death and the dying.

67-7 URBAN PLANNING

A study of urban growth, planning problems, and solutions. Topics include historical background on American cities; the dynamics of land use and city planning; and the problems of urban life: population, race and poverty, transportation, housing, education, financing, and government.

67-9 OTHER

Includes courses not easily placed above such as social science for agriculture majors, regional studies, human sexuality, human factors and safety, alcholism, and the future of man and America.

68 HISTORY, SOCIOLOGY, AND PHILOSOPHY OF SCIENCE

These courses adopt an interdisciplinary focus on science applying historical, philosophical and sociological approaches to science and/or technology. Also within this category are courses on the origins of man, the future, science and religion, and science and literature. The courses tend to satisfy general education requirements.

68-1 History of science and technology

68-2 Philosophy of science

68-3 Science, technology and society

68-4 History, philosophy, and sociology of science

68-5 Science and the humanities

68-6 Science and literature

68-1 HISTORY OF SCIENCE AND TECHNOLOGY

The courses within this category provide a historical perspective of technology and the sciences generally or by discipline, e.g., biology, psychology. These courses seek to place present day scientific and technological issues into perspective, usually for science majors or students enrolled in technological programs, but also as a general education course.

68-2 PHILOSOPHY OF SCIENCE

These courses examine the concept and methods of science and the belief system presupposed by scientists. They include methods of analysis, such as analysis of causal relations, the role of hypotheses, the use of statistics and other aspects of inductive logic. Ethics courses investigate the moral problems in medicine and biology and include topics of current concern, e.g., abortion, food distribution, experimentation on human subjects. These courses are designed for science and philosophy majors as well as general education students.

68-3 SCIENCE, TECHNOLOGY AND SOCIETY

These courses relate science to the everyday world and examine the social, political and humanistic ramifications of science. Most courses emphasize man's influence in a society with finite resources and how society deals with technological problems. Besides general elective courses, this category includes courses such as technological assessments of society for purposes of urban planning as part of an urban planning curriculum.

68-4 HISTORY, PHILOSOPHY, AND SOCIOLOGY OF SCIENCE

This category includes courses which combine history, philosophy and/or sociology of science to satisfy general education requirements. These courses often approach science by examining the contributions of famous scientists.

68-5 SCIENCE AND THE HUMANITIES

The interdisciplinary courses within this category deal with such subjects as the ascent of man, the future, man and nature, and science and religion. These general education courses often adopt a thematic approach, such as a consideration of the Bible and evolution, or time, space, and deity.

68-6 SCIENCE AND LITERATURE

These courses approach science through literature, most often through science fiction. The themes and trends of the literature are combined with a discussion of the scientific background. Science and literature courses attempt to deal with the cultural implications of science and technology.

APPENDIX B

LETTERS TO COLLEGE PRESIDENTS, FACILITATORS, AND FACULTY

CENTER FOR THE STUDY OF COMMUNITY COLLEGES
A NON PROFIT CORPORATION

ARTHUR M. COHEN
JOHN LOMBARDI
FLORENCE B. BRAWER

1047 GAYLEY AVENUE, SUITE 104
LOS ANGELES, CALIFORNIA 90024
(213) 477-6093

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(INVITATION TO PARTICIPATE IN SCIENCE STUDY—WRITTEN TO PRESIDENTS OF 178 COLLEGES IN THE NEH STUDY.)

November 2, 1977

President Fred L. Esvelt
Columbia Basin College
Pasco, WA 99301

Dear President Esvelt:

Many thanks for your cooperation in our study of curriculum and instruction in the humanities in two-year colleges nationwide. Mr. Robert Z. Fisher was very helpful in distributing survey forms and providing other information. We will be sending reports to you and we are also making recommendations to state and federal agencies regarding support for the humanities.

We have recently received a grant from the National Science Foundation to conduct a similar study in the sciences, and would like to include Columbia Basin College in the sample. We need the name of a person on your staff who could serve as an on-campus facilitator to distribute and retrieve survey forms from a sample of your science instructors. This could be the same facilitator who assisted in the humanities survey or someone more closely affiliated with the sciences.

Please return the enclosed form. We look forward to working in cooperation with you again on these important national studies.

Cordially,

Arthur M. Cohen
Principal Investigator

Florence B. Brawer
Research Director

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Enclosure

CENTER FOR THE STUDY OF COMMUNITY COLLEGES
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(FOLLOW-UP LETTER TO COLLEGE PRESIDENTS)

December 21, 1977

President James Fitzgibbons
Hudson Valley Community College
Troy, N.Y. 12180

Dear President Fitzgibbons:

Your college staff was extremely cooperative in our study of curriculum and instruction in the humanities. As we noted in an earlier letter to you, we are now conducting a similar study in the sciences under National Science Foundation sponsorship, and would like to include Hudson Valley Community College in the sample.

A small percentage of your science and technology faculty will be asked to participate in the study by responding to a survey form. We need the name of a person on your staff who could serve as an on-campus facilitator to distribute and retrieve surveys.

Please return the enclosed form. We hope you will choose to participate in this important national study.

Cordially,

Arthur M. Cohen
President

Enclosure

AMC:ah

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(INVITATION LETTER TO COLLEGE PRESIDENTS—SENT TO 46 COLLEGES NOT IN PREVIOUS SAMPLE)

Dear

For the past three years we have been studying the humanities in a sample of two-year colleges nationwide. Now, under National Science Foundation sponsorship, we are beginning a similar study of the sciences and technologies. Florence B. Brawer and I continue to direct the study. I am the Principal Investigator, a Professor of Higher Education at UCLA, Director of the ERIC Clearinghouse for Junior Colleges, and President of the Center. Dr. Brawer is Research Educator with the Clearinghouse, a Lecturer in Higher Education at UCLA, and Research Director of the Center.

We are writing to you at this time because we are expanding our original sample of colleges and we want your college to participate. Participation requires that you send us:

1. Your 1977-78 college catalogue
2. Your Spring 1977 schedule of day and evening classes
3. Your Fall 1977 schedule of day and evening classes
4. The name of an on-campus facilitator.

The facilitator, who will coordinate activities between your campus and our Center, may be anyone who can distribute and retrieve survey forms from a sample of science and technology instructors.

Data about individual colleges and participants will not be revealed, but will be reported in aggregate form to provide information about nationwide curricular patterns and instructional practices and trends.

Because of the high response rates in our previous surveys and the interest that the findings have generated, we feel confident that this curriculum study will be equally well received. We sincerely hope that your college will participate in this study and we look forward to receiving these materials along with the enclosed letter of response. Your involvement will contribute to the success of this important project.

Cordially,

Arthur M. Cohen
Principal Investigator

Florence B. Brawer
Research Director

Enclosure

(ACCEPTANCE FORM INCLUDED IN ALL INVITATIONS TO PRESIDENTS)

Arthur M. Cohen
Center for the Study of Community Colleges
1047 Gayley Avenue, Suite 205
Los Angeles, Calif. 90024

Dear Dr. Cohen,

Yes, our college will participate in the nationwide study of the sciences and technologies in two--year colleges.

The name of the facilitator who will coordinate activities between our college and your Center is:

_____
(Name)

_____
(Title)

It is my understanding that you will send a survey form to the facilitator who will also disseminate and retrieve another survey to a small sample of faculty members.

Cordially,

_____
(Name)

_____
(Institution)

_____
(Address)

_____

CENTER FOR THE STUDY OF COMMUNITY COLLEGES
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(INTRODUCTORY LETTER SENT TO ALL FACILITATORS)

Dear Colleague:

Your college is participating in a nationwide study of the sciences and technologies in two-year colleges. Your president has indicated that you will act as facilitator for this study, distributing and retrieving a survey form from a sample of the faculty teaching in the science fields at your college.

The project is sponsored by the National Science Foundation so that they may gain baseline information on curriculum and instruction in the fields under their purview. On past surveys of this type we have had exceedingly high response rates, attributable primarily to diligent on-campus facilitators.

In a few weeks we will be sending you the survey forms to be distributed to the instructors who we will select. We very much appreciate your college's participation in this important project as well as your personal help.

Cordially,

Arthur M. Cohen
Principal Investigator

Florence B. Brawer
Research Director

J:ah

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(INSTRUCTIONS FOR SURVEY DISTRIBUTION SENT TO ALL FACILITATORS)

Dear Colleague:

Thank you for participating in our nationwide study of sciences and science-related technologies in two-year colleges. We need your help in distributing a survey form to a group of instructors that we have selected at random. The form asks about instructional goals and practices. The data will be compiled on a nationwide basis; no instructor's responses will be singled out.

We have selected a sample of course sections taken from your Fall, 1977 schedule of classes. These sections are listed along with the designated instructor on the enclosed CHECKLIST. It is essential that the instructor of each of the selected course sections respond to this survey. If you know that a named section was assigned to a different instructor, please give the survey form to that person. If the section was canceled, specify why on the first page of the form and return it to us when you return the others.

Enclosed are the survey materials. An individual packet has been prepared for each class section. Each packet contains a letter, a questionnaire, and an envelope addressed to you. Please distribute these packets personally or, if it is too inconvenient to hand the material to the faculty members, you may want to include a personal note with each packet urging that the form be completed. When the questionnaire is completed, the respondent will seal it in the envelope and return it to you.

As you receive the completed questionnaires, check off the respondents' names on the CHECKLIST. When you receive all the survey forms, return the sealed envelopes to us. An address label is provided for this purpose. Try to get them all in the mail by March 31.

If you have any questions, please call us collect. Also, we will be pleased to get in touch with any faculty member who needs clarification on the purposes of the survey; let us know if instances arise where you feel this would be desirable.

Thanks again for your participation in this important national study. We recognize that it takes time for you to do all this, but we must involve a responsible person on each campus in order to obtain a sizeable response to the survey.

Cordially,

Arthur M. Cohen
Principal Investigator

Enclosures

AMC/lm

(SURVEY RECEIPT RETURN POSTCARD)

Dear Dr. Cohen:

I have received the survey forms and they are being distributed to the faculty. Survey forms intended for faculty who are no longer at the college I will mark "UNDELIVERABLE" and return with the completed surveys by March 31, 1978.

NAME _____

INSTITUTION _____ DATE _____

(CHECKLIST OF INSTRUCTORS SURVEYED—INCLUDED IN FACILITATORS' SURVEY PACKETS)133

CHECKLIST FOR_____ #_____

_____

COLLEGE_____

Instructor	Course	Section	Date Returned

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(FOLLOW-UP LETTER TO FACILITATORS)

April 17, 1978

Dear Colleague:

Our national study of curriculum and instruction in the sciences and science-related technologies is well on its way, and we appreciate your participation in this project.

On we sent survey forms to you for distribution to a sample of your faculty. Have you received them? If not, please call us collect at (213) 477-6093 immediately. If you have received them, we hope that you can get them all back to us within the next ten days.

Please take care in packaging the forms for return to the Center and send them by first class mail.

Thanks very much for your help.

Cordially,

Arthur M. Cohen
Principal Investigator

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(LETTER TO FACILITATORS WHO DID NOT ACCOUNT FOR ALL THE SURVEYS)

Dear Colleague:

Thank you for returning the science and science-related technologies survey forms. We appreciate your efforts in this important national study. However, we have not received the forms from the following instructor(s):

INSTRUCTOR	COURSE

In the event that any of these instructors have misplaced their surveys, a new form for each of them is enclosed. If the class section listed was cancelled, or the instructor is no longer at your college, please return these survey forms with a notation as to why they are not completed.

Because of the careful sampling involved, the success of our study depends on a very high response rate. If we can be of assistance, or if you need a procedural clarification, feel free to call us collect.

Thanks again for your assistance.

Cordially,

A. Cohen

Arthur M. Cohen
Principal Investigator

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(FINAL FOLLOW-UP TO FACILITATORS)

May 5, 1978

Dear Colleague:

We appreciate your willingness to assist us in our survey of sciences and technologies in two-year colleges, but to date we have not received any surveys from your school.

We are compelled to set a cut-off date of May 26, 1978, after which we will not be able to include the responses in our data set. Because of the careful sampling involved, it is critical that we receive as many responses as possible from each school in our sample.

If you could please make one final effort to retrieve the surveys and mail them in time to reach us by May 26, we would be most grateful.

Sincerely,

Arthur M. Cohen
Principal Investigator

Andrew Hill
Projects Coordinator

CENTER FOR THE STUDY OF COMMUNITY COLLEGES
A NON PROFIT CORPORATION

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(SURVEY INSTRUCTIONS FOR FACULTY)

IMPORTANT INSTRUCTIONS

Dear Faculty Member,

Thank you for taking the time to complete this questionnaire. To ensure your confidentiality, we have provided you with an envelope in which you should seal your completed survey form. Please return this envelope to the campus facilitator to whom it is addressed by March 29. If you did not teach the class section indicated on the survey form, please return the packet to the facilitator so that it can be forwarded to the proper instructor.

After collecting all the forms from your colleagues, your facilitator will return the sealed envelopes to us.

We appreciate your prompt attention and participation in this important educational survey.

Cordially,

A. M. Cohen

Arthur M. Cohen
Principal Investigator

Enclosures

AMC/lm

APPENDIX C

SAMPLE COLLEGES AND CATEGORIES

College and State

Number: Serial # given for coding purposes.

Region: Geographical region by state.

NE Northeast	MS Middle Sts.	S South	MW Midwest	MP Mtn/Plains	W West
Conn.	Delaware	Ala.	Ill.	Colo.	Ala.
Maine	D.C.	Ark.	Ind.	Idaho	Ariz.
Mass.	Maryland	Fla.	Iowa	Mont.	Cal.
New Ham.	New Jer.	Ga.	Mich.	Kan.	Haw.
Rh. Isl.	N.Y.	Kent.	Minn.	Neb.	Nev.
Vermont	Penn.	Louis.	Mo.	N.Dak.	Ore.
	W. Va.	Miss.	Ohio	New. Mex.	Wash.
		N.C.	Wisc.	Okla.	
		S.C.		S. Dak.	
		Tenn.		Utah	
		Tex.		Wyo.	
		Va.			

Control: Public (pub) or Private (pri) ownership of the college.

Emphasis: Comprehensive (cmp), Liberal Arts (la), or Vocational/Technical (vt).

Age: 1) Colleges opening after 1970
2) Colleges opening between 1960-1969
3) Colleges opening before 1959.

Size: Number of Students enrolled.

1) 1-499
2) 500-999
3) 1000-1499
4) 1500-2499
5) 2500-4999
6) 5000-7499
7) 7500-9999
8) 10000-14999
9) 15000+

Organization: Single campus (sing), Multi-campus District (mlt), or Two-year Branch of a Four-year Institution (brch).

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Austin (Minn)	001	MW	pub	cmp	3	2	sing
Bay Path (Mass)	002	NE	pri	cmp	3	2	sing
Brevard (Fla)	003	S	pub	cmp	2	7	sing
Central Virginia (VA)	004	S	pub	cmp	2	5	sing
Chowan (NC)	005	S	pri	cmp	3	3	sing
Citrus (Cal)	006	W	pub	cmp	3	7	sing
Clinton (Iowa)	007	MW	pub	cmp	3	2	mlt
Itawamba (Miss)	008	S	pub	cmp	3	4	sing
Jackson State (Tenn)	009	S	pub	cmp	2	4	sing
James Faulkner (Ala)	010	S	pub	cmp	2	4	sing
Jefferson Davis (Miss)	011	S	pub	cmp	2	4	brch
Metropolitan Tech (Neb)	012	MP	pub	vt	1	5	sing
Middle Georgia (GA)	013	S	pub	cmp	3	4	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Mitchell (Conn)	014	NE	pri	cmp	3	2	sing
Monroe County (Mich)	015	MW	pub	cmp	2	4	sing
Morgan (Colo)	016	MP	pub	cmp	1	2	sing
Northern Virginia (VA) (Alexandria Campus)	017	S	pub	cmp	2	5	mlt
Saddleback (Cal)	018	W	pub	cmp	2	8	sing
Shawnee State (Ohio)	019	MW	pub	cmp	3	4	sing
Southeast (Ken)	020	S	pub	cmp	2	1	sing
St. Paul's (Mo)	021	MW	pri	la	3	1	sing
St. Gregory's (Okla)	022	MP	pri	la	3	1	sing
Vermont Col. (Ver)	023	NE	pri	cmp	3	1	brch
UW: Sheboygan (WI)	024	MW	pub	la	3	2	brch
Halifax City Tech (NC)	025	S	pub	vt	2	2	sing
Wood (Miss)	026	S	pri	la	3	1	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Mt. San Jacinto (Cal)	027	W	pub	cmp	2	4	sing
Western Texas (TX)	028	S	pub	cmp	1	3	sing
Southwest Mississippi (Miss)	029	S	pub	cmp	3	3	sing
Hudson Valley (NY)	031	MS	pub	cmp	3	6	sing
Quinebaug Valley (CN)	034	NE	pub	cmp	1	2	sing
Suomi Col. (Mich)	035	MW	pri	cmp	3	1	sing
Col. of the Desert (Cal)	037	W	pub	cmp	2	7	sing
Harcum JC (Penn)	039	MS	pri	cmp	3	2	sing
Wake Tech (NC)	040	S	pub	vt	2	3	sing
Angelina (Tex)	041	S	pub	cmp	2	4	sing
Northern Oklahoma (OK)	042	MP	pub	cmp	3	4	sing
Central (Kan)	045	MP	pri	la	3	1	sing
Delaware Cty (Penn)	046	MS	pub	cmp	2	6	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
U. of Minn. Tech.: Waseca (Minn)	047	MW	pub	vt	1	2	brch
Col. of San Mateo (Cal)	048	W	pub	cmp	3	8	mlt
Southeastern (Iowa) (So. Campus)	049	MW	pub	cmp	3	1	mlt
Lamar (Orange County) Center (TX)	052	S	pub	la	2	2	brch
Santa Rosa (Cal)	053	W	pub	cmp	3	8	sing
Tidewater (VA)	054	S	pub	cmp	2	8	mlt
Iowa Lakes (Iowa) (South Center)	055	MW	pub	cmp	2	3	mlt
American River (Cal)	056	W	pub	cmp	3	9	mlt
Lincoln Land (Ill)	057	MW	pub	cmp	2	6	sing
Lorain (Ohio)	058	MW	pub	cmp	2	6	sing
Waubonsee (Ill)	059	MW	pub	cmp	2	6	sing
Barton (Kan)	060	MP	pub	cmp	2	3	sing
District One Tech. (Wisc.)	061	MW	pub	vt	3	5	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
North Country (NY)	062	MS	pub	cmp	3	3	sing
Howard (MD)	065	MS	pub	cmp	1	4	sing
Mt. Wachusett (Mass)	066	NE	pub	cmp	2	5	sing
North Hennepin (Minn)	067	MW	pub	cmp	2	5	sing
Palm Beach (FL)	068	S	pub	cmp	3	7	sing
Lurleen Wallace (Ala)	069	S	pub	cmp	2	2	sing
U. of SC: Lancaster (SC)	071	S	pub	cmp	2	2	brch
Presentation (SD)	072	MP	pri	cmp	3	1	sing
Greater Hartford (Conn)	073	NE	pub	cmp	2	5	sing
Edgecombe Tech. (NC)	074	S	pub	vt	2	2	sing
Northeast Christian (Pa)	076	MS	pri	la	3	1	sing
South Seattle (Wash)	077	W	pub	cmp	1	5	mlt
CC of Allegheny (Pa) (Boyce Campus)	080	MS	pub	cmp	2	5	mlt

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Coastal Carolina (NC)	081	S	pub	cmp	2	4	sin
Lenoir (NC)	082	S	pub	cmp	2	4	sin
Greenville Tech. (SC)	084	S	pub	cmp	1	6	sin
Mary Holmes (Miss)	085	S	pri	cmp	3	1	sin
Martin (Tenn)	087	S	pri	la	3	1	sin
Lassen (Cal)	089	W	pub	cmp	3	5	sin
Mendocino (Cal)	090	W	pub	cmp	1	4	sin
Hartnell (Cal)	093	W	pub	cmp	3	6	sin
Clark Cty. (Nev)	094	W	pub	cmp	1	6	sin
Mt. Hood (Ore)	095	W	pub	cmp	2	7	sin
Valencia (Fla)	096	S	pub	cmp	2	7	sin
Northampton (Pa)	098	MS	pub	cmp	2	5	sin
San Diego Mesa (Cal)	099	W	pub	cmp	2	8	mlt

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Lakeshore/Sheboygan (Wisc.)	101	MW	pub	vt	3	4	mlt
Oakland/Auburn (Mich)	102	MW	pub	cmp	2	9	mlt
LA Pierce (Cal)	104	W	pub	cmp	3	9	mlt
Atlantic (NJ)	107	MS	pub	cmp	2	5	sing
Goldey Beacom (Del)	108	MS	pri	vt	3	4	sing
Southern Seminary (VA)	109	S	pri	cmp	3	1	sing
Danville (Ill)	110	MW	pub	cmp	3	5	sing
Utah Tech at Provo (Utah)	111	MP	pub	cmp	3	5	sing
White Pines (NH)	112	NE	pri	cmp	2	1	sing
Chemeketa (Ore)	113	W	pub	cmp	2	6	sing
Butte (Cal)	114	W	pub	cmp	2	6	sing
Connors State (OK)	116	MP	pub	la	3	4	sing
Wheeling: W.Virginia Northern (VA)	119	MS	pub	cmp	1	6	mlt

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	
Floyd (GA)	120	S	pub	cmp	1	4	si
Peninsula (Wash)	121	W	pub	cmp	2	4	si
U. of Maine/Augusta (Me.)	122	NE	pub	cmp	2	5	br
Milwaukee Area Tech. (Wisc.)	123	MW	pub	vt	3	8	ml
Wytheville (VA)	124	S	pub	cmp	3	4	si
Delta (Mich)	125	MW	pub	cmp	2	7	si
Southern (OK) Oklahoma City	126	MP	pub	cmp	1	5	si
Fresno City (Cal)	127	W	pub	cmp	3	9	ml
U. of Toledo C&T (Ohio)	129	MW	pub	vt	3	5	br
Hesston (Kan)	130	MP	pri	cmp	3	2	si
Platte (Neb)	131	MP	pub	cmp	2	3	ml
Morristown (Tenn)	134	S	pri	la	3	1	si
Champlain (Vt)	135	NE	pri	cmp	3	3	si

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Keystone (Penn)	136	MS	pri	la	3	2	sing
Central YMCA (Ill)	138	MW	pri	cmp	2	5	sing
Delaware Tech: Terry	139	MS	pub	vt	1	3	mlt
Middlesex Cty (NJ)	140	MS	pub	cmp	2	8	sing
Green River (Wash)	144	W	pub	cmp	2	6	sing
Pima (W.Campus) (Ariz)	145	W	pub	cmp	1	9	sing
Oakton (Ill)	146	MW	pub	cmp	1	8	sing
Bunker Hill (Mass)	147	NE	pub	cmp	1	5	sing
Hagerstown (MD)	148	MS	pub	cmp	3	4	sing
Marshalltown (Iowa)	149	MW	pub	cmp	3	3	mlt
Harford (Md)	150	MS	pub	cmp	3	5	sing
Sinclair (Ohio)	151	MW	pub	cmp	3	2	sing
Coffeyville (Kan)	153	MP	pub	cmp	3	2	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
CC of Denver/Auraria (Colo)	155	MP	pub	cmp	1	5	ml
Lower Columbia (Wash)	158	W	pub	cmp	3	5	si
Kishwaukee (Ill)	159	MW	pub	cmp	2	5	si
South Georgia (Ga)	160	S	pub	cmp	3	3	si
Merced (Cal)	161	W	pub	cmp	2	7	si
Wm. Rainey Harper (Ill)	163	MW	pub	cmp	2	8	si
N.H. Tech. (Concord) (NH)	164	NE	pub	vt	2	3	si
Roanoke-Chowan Tech. (NC)	165	S	pub	vt	2	2	br
San Bernardino Valley (Cal)	166	W	pub	cmp	3	9	ml
Hillsdale Free Will Bap. (OK)	167	MP	pri	la	2	1	si
Miles (Mont)	168	MP	pub	cmp	3	2	si
Arapahoe (Colo)	171	MP	pub	cmp	2	6	si
No. Dakota St.Sc.of Sci. (ND)	172	MP	pub	vt	3	5	sin

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
San Antonio (Tex)	173	S	pub	cmp	3	9	mlt
Hawkeye Inst.Tech. (Iowa)	174	MW	pub	vt	2	4	sing
Kirtland Comm.Col. (Mich)	175	MW	pub	cmp	1	2	sing
Western Wisconsin Tech. (Wis)	176	MW	pub	vt	2	5	mlt
Thomas Nelson (Va)	177	S	pub	cmp	2	5	sing
New River (Va)	178	S	pub	cmp	1	4	sing
Seminole (Fla)	180	S	pub	cmp	2	5	sing
Pearl River	181	S	pub	cmp	3	4	sing
Cayuga County	182	MS	pub	cmp	3	5	sing
Umpqua (Ore)	183	W	pub	cmp	2	4	sing
St.John's (Kan)	184	MP	pri	la	3	1	sing
Weatherford (Tex)	186	S	pub	cmp	3	3	sing
NW Alabama (Ala)	187	S	pub	cmp	2	3	sing
Cochise (Ariz)	188	W	pub	cmp	2	5	sing
Potomac St. (WV)	191	MS	pub	cmp	3	3	brch
Col. of Sequoia (Cal)	192	W	pub	cmp	3	6	sing
Mississippi County (Ark)	194	S	pub	cmp	1	2	sing
Edison St. (Ohio)	195	MW	pub	cmp	1	2	sing
Northwest Tech. (Ohio)	197	MW	pub	vt	2	2	sing
Bainbridge (Ga)	198	S	pub	cmp	1	2	sing
Willmar (MN)	199	MW	pub	cmp	2	2	sing
John C. Calhoun (Ala)	200	S	pub	cmp	1	5	sing
Kalamazoo (Mich)	201	MW	pub	cmp	2	6	sing
Bay de Noc (Mich)	202	MW	pub	cmp	2	3	sing
Three Rivers (Mo)	203	MW	pub	cmp	2	3	sing
Indian Hills (Iowa)	204	MW	pub	cmp	2	3	mlt

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Villa Julie (Md)	206	MS	pri	la	3	2	sing
Highland (Ill)	207	MW	pub	cmp	2	4	sing
Central Baptist (Ar)	208	S	pri	la	3	1	sing
Westark (Ar)	209	S	pub	cmp	3	5	sing
Florida (Fl)	210	S	pri	cmp	3	1	sing
Central Wyoming (Wy)	211	MP	pub	cmp	2	2	sing
Ketchikan (Alaska)	212	W	pub	cmp	3	1	brch
Shelby St. (Tn)	213	S	pub	cmp	1	5	sing
Edison (Fl)	214	S	pub	cmp	2	5	sing
Georgia Military (Ga)	215	S	pub	cmp	3	1	sing
Clayton (Ga)	216	S	pub	cmp	2	5	sing
Northeastern (Colo)	217	MP	pub	cmp	3	3	sing
Northland (Mn)	218	MW	pub	cmp	2	1	sing

COLLEGE	NUMBER	REGION	CONTROL	EMPHASIS	AGE	SIZE	ORGANIZATION
Dundalk (Md)	219	MS	pub	cmp	1	4	sin
Vernon (Tx)	220	S	pub	cmp	1	3	sin
Atlanta JC (Ga)	221	S	pub	cmp	1	4	sin
Genesee (NY)	222	MS	pub	cmp	2	4	sin
E. Utah (Utah)	223	MP	pub	cmp	3	2	sin
Richmond Tech (NC)	225	S	pub	vt	2	3	sin

175 COLLEGES IN SAMPLE BY STATE

Alabama

James Faulkner State
John C. Calhoun State
Lurleen B. Wallace State
Northwest Alabama State

Alaska

Ketchikan

Arizona

Cochise
Pima

Arkansas

Central Baptist
Mississippi County
Westark

California

American River
Butte
Citrus
College of San Mateo
College of the Desert
College of the Sequoias
Fresno City College
Hartnell
Lassen
Los Angeles Pierce
Mendocino
Merced
Mt. San Jacinto
Saddleback
San Bernardino Valley
San Diego Mesa
Santa Rosa

Colorado

Arapahoe
Community College of Denver/
Auraria Campus
Morgan
Northeastern

Connecticut

Greater Hartford
Mitchell
Quinebaug Valley

Delaware

Delaware Tech. and C.C./
Terry Campus
Goldey Beacom

Florida

Brevard
Edison
Florida
Palm Beach
Seminole
Valencia

Georgia

Atlanta
Bainbridge
Clayton
Floyd
Georgia Military
Middle Georgia
South Georgia

Illinois

Central YMCA
Danville
Highland
Kishwaukee
Lincoln Land
Oakton
Waubonsee
William Rainey Harper

Iowa

Clinton
Hawkeye Inst. of Tech.
Indian Hills
Iowa Lakes
Marshalltown
Southeastern

Kansas

Barton County
Central
Coffeyville
Hesston
St. John's

Kentucky

Southeast

Maine

Univ. of Maine/
Augusta

Maryland

Dundalk
Hagerstown
Harford
Howard
Villa Julie

Massachusetts

Bay Path
Bunker Hill
Mt. Wachusett

Michigan

Bay de Noc
Delta
Kalamazoo Valley
Kirtland
Monroe County
Oakland
Suomi

Minnesota

Austin
North Hennepin
Northland
U. of Minn. Tech.
Willmar

Mississippi

Itawamba
Mary Holmes
Miss. Gulf Coast/
Jeff.Davis Campus
Pearl River
Southwest Miss.
Wood

Missouri

St. Paul's
Three Rivers

Montana

Miles

Nebraska

Metropolitan Tech.
Platte Tech.

Nevada

Clark County

New Hampshire

New Hampshire Tech.
White Pines

New Jersey

Atlantic
Middlesex County

New York

Cayuga County
Genesee
Hudson Valley
North Country

North Carolina

Chowan College
Coastal Carolina
Edgecombe Tech.
Halifax City Tech.
Lenoir
Richmond Tech.
Roanoke-Chowan Tech.
Wake Tech.

North Dakota

North Dakota St.Sch.
of Science

Ohio

Edison State
Lorain County
Northwest Tech.
Shawnee State
Sinclair
Univ. of Toledo
Comm. and Tech.

Oklahoma

Connors State
Hillsdale Free Will
Baptist
Northern Oklahoma
South Oklahoma City
St. Gregory's

Oregon

Chemeketa
Mt. Hood
Umpqua

Pennsylvania

Allegheny County/
Boyce Campus
Delaware County
Harcum
Keystone
Northampton County
Northeastern Christian

South Carolina

Greenville Tech.
U. of S. Carolina/
Lancaster

South Dakota

Presentation

Tennessee

Jackson State
Martin
Morristown
Shelby State

Texas

Angelina
Lamar U./ Orange
Branch
San Antonio
Vernon Regional
Weatherford
Western Texas

Utah

Col. of Eastern
Utah
Utah Tech.

Vermont

Champlain
Vermont Col. of
Norwich U.

Virginia

Central Va.
Northern Va./
Alexandria
New River
Southern Seminary
Tidewater
Thomas Nelson
Wytheville

Washington

Green River
Lower Columbia
Peninsula
South Seattle

West Virginia

West Va. Northern
Potomac State

Wisconsin

District One Tech.
Lakeshore Tech.
Milwaukee Area Tech.
University Center System/
Sheboygan
Western Wisconsin Tech.

Wyoming

Central Wyoming

APPENDIX D

FIRST LEVEL CLASSIFICATION SHEET

College No.		Course Code	No of Sec	S 77 Lec	S 77 Lab	F 77 Lec	F 77 Lab	W 78 Lec	W 78 Lab	Hours Lec	Hours Lab	Hours Disc	Hours Un	Prerequisites	Notes
Dept	Course Number														
1.															
2.															
3.															
4.															
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16.															
17.															
18.															
19.															
20.															
21.															
22.															

CSCC-NSF+77-01 REV

APPENDIX E

SURVEY INSTRUMENT

480-006

Center for the Study of Community Colleges

INSTRUCTOR SURVEY

Your college is participating in a nationwide study conducted by the Center for the Study of Community Colleges under a grant from the National Science Foundation. The study is concerned with the role of the sciences and technologies in two-year colleges — curriculum, instructional practices and course activities.

The survey asks questions about one of your classes offered last fall. The information gathered will help inform groups making policy affecting the sciences. All information gathered is treated as confidential and at no time will your answers be singled out. Our concern is with aggregate instructional practices as discerned in a national sample.

We recognize that the survey is time-consuming and we appreciate your efforts in completing it. Thank you very much.

1a. Your college's class schedule indicated that in Fall, 1977 you were teaching:

_____ (Course) 11-13 _____ (Section)

If this class was assigned to a different instructor, please return this survey to your campus facilitator to give to the person who taught this class.

If the class was not taught, please give us the reason why, and then return the uncompleted survey form in the accompanying envelope.

b. Class was not taught because: (explain briefly) _____

_____

_____

Please answer the questions in relation to the specified class.

2. Approximately how many students were initially enrolled in this class?

Males _____ 14-16

Females _____ 17-19

3. Approximately how many students completed this course and received grades? (Do not include withdrawals or incompletes.)

Males _____ 20-22

Females _____ 23-25

4. Check each of the items below that you believe properly describes this course:

a. Parallel or equivalent to a lower division college level course at transfer institutions . . . . . ☐ 1 — 26

b. Designed for transfer students majoring in one of the natural resources fields (e.g., agriculture, forestry) or an allied health field (e.g., nursing, dental hygiene, etc.) . . . . . ☐ 2

c. Designed for transfer students majoring in one of the physical or biological sciences, engineering, mathematics, or the health sciences (e.g., pre-medicine, pre-dentistry) . . . . . ☐ 3

d. Designed for transfer students majoring in a non-science area . . . ☐ 4

e. Designed for occupational students in an allied health area . . . . ☐ 5

f. Designed for occupational students in a science technology or engineering technology area . . . . . ☐ 6

g. Designed as a high school make up or remedial course . . . . . ☐ 7

h. Designed as a general education course for non-transfer and non-occupational students . . . . . ☐ 8

i. Designed for further education or personal upgrading of adult students . . . . . ☐ 9

j. Other *(please specify)*:_____ ☐ 0

5a. Instructors may desire many qualities for their students. Please select the one quality in the following list of four that you most wanted your students to achieve in the specified course.

1) Understand/appreciate interrelationships of science and technology with society . . . . . ☐ 1 — 27

2) Be able to understand scientific research literature . . . . . ☐ 2

3) Apply principles learned in course to solve qualitative and/or quantitative problems . . . . . ☐ 3

4) Develop proficiency in laboratory methods and techniques of the discipline . . . . . ☐ 4

b. Of the four qualities listed below, which one did you most want your students to achieve?

1) Relate knowledge acquired in class to real world systems and problems . . . . . ☐ 1 — 28

2) Understand the principles, concepts, and terminology of the discipline . ☐ 2

3) Develop appreciation/understanding of scientific method . . . . ☐ 3

4) Gain "hands-on" or field experience in applied practice . . . . . ☐ 4

c. And from this list, which one did you most want your students to achieve in the specified class.

1) Learn to use tools of research in the sciences . . . . . ☐ 1 — 29

2) Gain qualities of mind useful in further education . . . . . ☐ 2

3) Understand self . . . . . ☐ 3

4) Develop the ability to think critically . . . . . ☐ 4

6a. Were there prerequisite requirements for this course? Yes ☐ 1 No ☐ 2 — 30

b. IF YES: Which of the following were required? (CHECK AS MANY AS APPLY)

1) Prior course in the same discipline taken in high school ☐ 1 . . college ☐ 7 — 31

2) Prior course in any science taken in high school ☐ 2 . . college ☐ 8

3) Prior course in mathematics taken in high school ☐ 3 . . college ☐ 9

4) Declared science or technology major . . . . . ☐ 4

5) Achieved a specified score on entrance examination . ☐ 5

6) Other *(please specify)*:_____ ☐ 6

7. **Over the entire term, what percentage of class time is devoted to each of the following:**

a. Your own lectures	_____%	32/33
b. Guest lecturers	_____%	34/35
c. Student verbal presentations	_____%	36/37
d. Class discussion	_____%	38/39
e. Viewing and/or listening to film or taped media	_____%	40/41
f. Simulation/gaming	_____%	42/43
g. Quizzes/examinations	_____%	44/45
h. Field trips	_____%	46/47
i. Lecture/demonstration experiments	_____%	48/49
j. Laboratory experiments by students	_____%	50/51
k. Laboratory practical examinations and quizzes	_____%	52/53
l. Other *(please specify)*:_____		
_____	_____%	54/55

Please add percentages to make sure they agree with total TOTAL: 100 %

8. **How frequently were each of the following instructional media used in this class?**

Also check last box if you or any member of your faculty developed any of the designated media for this course.

	Frequently used	Occasionally used	Never used	Developed by self or other faculty member	
a. Films	☐1	☐2	☐3	☐4	56
b. Single concept film loops	☐1	☐2	☐3	☐4	57
c. Filmstrips	☐1	☐2	☐3	☐4	58
d. Slides	☐1	☐2	☐3	☐4	59
e. Audiotape/slide/film combinations	☐1	☐2	☐3	☐4	60
f. Overhead projected transparencies	☐1	☐2	☐3	☐4	61
g. Audiotapes, cassettes, records	☐1	☐2	☐3	☐4	62
h. Videotapes	☐1	☐2	☐3	☐4	63
i. Television (broadcast/closed circuit)	☐1	☐2	☐3	☐4	64
j. Maps, charts, illustrations, displays	☐1	☐2	☐3	☐4	65
k. Three dimensional models	☐1	☐2	☐3	☐4	66
l. Scientific instruments	☐1	☐2	☐3	☐4	67
m. Natural preserved or living specimens	☐1	☐2	☐3	☐4	68
n. Lecture or demonstration experiments involving chemical reagents or physical apparatus	☐1	☐2	☐3	☐4	69
o. Other *(please specify)*:_____	☐1	☐2	☐3	☐4	70

9. Which of the following materials were used in this class? CHECK EACH TYPE USED. THEN, FOR EACH TYPE USED, PLEASE ANSWER ITEMS A-D.

	A.	B.			C.		D.			
							How much say did you have in the selection of these materials?			
Check Materials Used	How many pages in total were students required to read?	How satisfied were you with these materials? Well-satisfied	Would like to change them	Definitely intend changing them	Did you prepare these materials? Yes	No	Total say	Selected them but had to verify with a chairperson or administrator	Was member of a group that selected them	Someone else selected them
☐ 1 Textbooks	_____ 13-15	16 ☐ 1	☐ 2	☐ 3	17 ☐ 1	☐ 2	18 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 2 Laboratory materials and workbooks	_____ 19-21	22 ☐ 1	☐ 2	☐ 3	23 ☐ 1	☐ 2	24 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 3 Collections of readings	_____ 25-27	28 ☐ 1	☐ 2	☐ 3	29 ☐ 1	☐ 2	30 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 4 Reference books	_____ 31-33	34 ☐ 1	☐ 2	☐ 3	35 ☐ 1	☐ 2	36 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 5 Journal and/or magazine articles	_____ 37-39	40 ☐ 1	☐ 2	☐ 3	41 ☐ 1	☐ 2	42 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 6 Newspapers	_____ 43-45	46 ☐ 1	☐ 2	☐ 3	47 ☐ 1	☐ 2	48 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 7 Syllabi and handout materials	_____ 49-51	52 ☐ 1	☐ 2	☐ 3	53 ☐ 1	☐ 2	54 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 8 Problem books	_____ 55-57	58 ☐ 1	☐ 2	☐ 3	59 ☐ 1	☐ 2	60 ☐ 1	☐ 2	☐ 3	☐ 4
☐ 9 Other *(please specify)* _____	_____ 61-63	64 ☐ 1	☐ 2	☐ 3	65 ☐ 1	☐ 2	66 ☐ 1	☐ 2	☐ 3	☐ 4

10. Please indicate the emphasis given to each of the following student activities in this class.

	Not included in determining student's grade	Included but counted less than 25% toward grade	Counted 25% or more toward grade	
a. Papers written outside of class	☐ 1	☐ 2	☐ 3	67
b. Papers written in class	☐ 1	☐ 2	☐ 3	68
c. Quick-score/objective tests/exams	☐ 1	☐ 2	☐ 3	69
d. Essay tests/exams	☐ 1	☐ 2	☐ 3	70
e. Field reports	☐ 1	☐ 2	☐ 3	71
f. Oral recitations	☐ 1	☐ 2	☐ 3	72
g. Workbook completion	☐ 1	☐ 2	☐ 3	73
h. Regular class attendance	☐ 1	☐ 2	☐ 3	74
i. Participation in class discussions	☐ 1	☐ 2	☐ 3	75
j. Individual discussions with instructor	☐ 1	☐ 2	☐ 3	76
k. Research reports	☐ 1	☐ 2	☐ 3	77
l. Non-written projects	☐ 1	☐ 2	☐ 3	78
m. Homework	☐ 1	☐ 2	☐ 3	79
n. Laboratory reports	☐ 1	☐ 2	☐ 3	80
o. Laboratory unknowns and/or practical exams (quantitative and qualitative)	☐ 1	☐ 2	☐ 3	12
p. Problem sets	☐ 1	☐ 2	☐ 3	13
q. Other *(please specify)*:_____	☐ 1	☐ 2	☐ 3	14

11. Examinations or quizzes given to students may ask them to demonstrate various abilities. Please indicate the importance of each of these abilities in the tests you gave in this course. (CHECK ONE BOX FOR EACH ITEM)

	Very important	Somewhat important	Not important	
a. Mastery of a skill	☐ 1	☐ 2	☐ 3	15
b. Acquaintance with concepts of the discipline	☐ 1	☐ 2	☐ 3	16
c. Recall of specific information	☐ 1	☐ 2	☐ 3	17
d. Understanding the significance of certain works, events, phenomena, and experiments	☐ 1	☐ 2	☐ 3	18
e. Ability to synthesize course content	☐ 1	☐ 2	☐ 3	19
f. Relationship of concepts to student's own values	☐ 1	☐ 2	☐ 3	20
g. Other *(please specify)*:_____	☐ 1	☐ 2	☐ 3	21

12. What was the relative emphasis given to each type of question in written quizzes and examinations? (PLEASE RESPOND BY CHECKING ONE OF THE THREE BOXES FOR EACH ITEM.)

	Frequently used	Seldom used	Never used	
a. Multiple response (including multiple choice and true/false)	☐ 1	☐ 2	☐ 3	22
b. Completion	☐ 1	☐ 2	☐ 3	23
c. Essay	☐ 1	☐ 2	☐ 3	24
d. Solution of mathematical type problems where the work must be shown	☐ 1	☐ 2	☐ 3	25
e. Construction of graphs, diagrams, chemical type equations, etc.	☐ 1	☐ 2	☐ 3	26
f. Derivation of a mathematical relationship	☐ 1	☐ 2	☐ 3	27
g. Other *(please specify)*:_____	☐ 1	☐ 2	☐ 3	28

13. What grading practice did you employ in this class? 29

ABCDF	☐ 1
ABCD/No credit	☐ 2
ABC/No credit	☐ 3
Pass/Fail	☐ 4
Pass/No credit	☐ 5
No grades issued	☐ 6
Other _____ *(please specify)*	☐ 7

14. For each of the following out-of-class activities, please indicate if attendance was required, recommended or neither.

	Attendance required for course credit	Attendance recommended but not required	Neither required nor recommended	
a. On-campus educational type films	☐ 1	☐ 2	☐ 3	30
b. Other films	☐ 1	☐ 2	☐ 3	31
c. Field trips to industrial plants, research laboratories	☐ 1	☐ 2	☐ 3	32
d. Television programs	☐ 1	☐ 2	☐ 3	33
e. Museums/exhibits/zoos/arboretums	☐ 1	☐ 2	☐ 3	34
f. Volunteer service on an environmental project	☐ 1	☐ 2	☐ 3	35
g. Outside lectures	☐ 1	☐ 2	☐ 3	36
h. Field trips to natural formation or ecological area	☐ 1	☐ 2	☐ 3	37
i. Volunteer service on education/ community project	☐ 1	☐ 2	☐ 3	38
j. Tutoring	☐ 1	☐ 2	☐ 3	39
k. Other *(please specify)*:_____	☐ 1	☐ 2	☐ 3	40

15a. Was this class conducted as an interdisciplinary course? 41

Yes	☐ 1
No	☐ 2

b. IF YES: Which other disciplines were involved?_____ *(please specify)*

_____ 42-

_____ 43-

16. Were instructors from other disciplines involved . . .

	YES	NO	
. . . in course planning?	☐ 1	☐ 2	44
. . . in team teaching?	☐ 1	☐ 2	45
. . . in offering guest lectures?	☐ 1	☐ 2	46

17a. Which of these types of assistance were available to you last term? CHECK AS MANY AS APPLY.

b. Which did you utilize? CHECK AS MANY AS APPLY.

	a. Assistance was available to me in the following areas	b. Utilized
a. Clerical help	47- ☐ 1	48- ☐ 1
b. Test-scoring facilities	☐ 2	☐ 2
c. Tutors	☐ 3	☐ 3
d. Readers	☐ 4	☐ 4
e. Paraprofessional aides/instructional assistants	☐ 5	☐ 5
f. Media production facilities/assistance	☐ 6	☐ 6
g. Library/bibliographical assistance	☐ 7	☐ 7
h. Laboratory assistants	☐ 8	☐ 8
i. Other *(please specify):*_____	☐ 9	☐ 9

18. Although this course may have been very effective, what would it take to have made it better? CHECK AS MANY AS APPLY.

a. More freedom to choose materials	☐ 1	49
b. More interaction with colleagues or administrators	☐ 2	
c. Less interference from colleagues or administrators	☐ 3	
d. Larger class (more students)	☐ 4	
e. Smaller class	☐ 5	
f. More reader/paraprofessional aides	☐ 6	
g. More clerical assistance	☐ 7	
h. Availability of more media or instructional materials	☐ 8	
i. Stricter prerequisites for admission to class	☐ 9	
j. Fewer or no prerequisites for admission to class	☐ 1	50
k. Changed course description	☐ 2	
l. Instructor release time to develop course and/or material	☐ 3	
m. Different goals and objectives	☐ 4	
n. Professional development opportunities for instructors	☐ 5	
o. Better laboratory facilities	☐ 6	
p. Students better prepared to handle course requirements	☐ 7	
q. Other *(please specify):*_____	☐ 8	

Now, just a few questions about you . . .

19. How many years have you taught in any two-year college? 51

a. Less than one year . . . . . ☐ 1
b. 1-2 years . . . . . ☐ 2
c. 3-4 years . . . . . ☐ 3
d. 5-10 years . . . . . ☐ 4
e. 11-20 years . . . . . ☐ 5
f. Over 20 years . . . . . ☐ 6

20. At this college are you considered to be a: 52

a. Full-time faculty member . . . . . ☐ 1
b. Part-time faculty member . . . . . ☐ 2
c. Department or division chairperson . . . ☐ 3
d. Administrator . . . . . ☐ 4
e. Other *(please specify):*

_____ . . . ☐ 5

21a. Are you currently employed in a research or industrial position directly related to the discipline of this course? 53

Yes ☐ 1
No ☐ 2

b. IF YES: For how many years?_____ 54/55

c. If previously you had been employed in a related industry or research organization, please indicate the number of years:_____ 56/57

22. What is the highest degree you presently hold? 58

a. Bachelor's . . . . . ☐ 1
b. Master's . . . . . ☐ 2
c. Doctorate . . . . . ☐ 3

IMPORTANT INSTRUCTIONS

Thank you for taking the time to complete this survey. Please seal the completed questionnaire in the envelope which is addressed to the project facilitator on your campus and return it to that person. After collecting the forms from all participants, the facilitator will forward the sealed envelopes to the Center.

We appreciate your prompt attention and participation in this important survey for the National Science Foundation.

Arthur M. Cohen
Principal Investigator

Florence B. Brawer
Research Director

APPENDIX F

LETTER TO DISCIPLINARY ASSOCIATIONS

CENTER FOR THE STUDY OF COMMUNITY COLLEGES

A NON PROFIT CORPORATION

ARTHUR M. COHEN
JOHN LOMBARDI
FLORENCE B. BRAWER

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The Center for the Study of Community Colleges, supported by a grant from the National Science Foundation, is currently involved in a study of science and science-related technology education in two-year colleges. The enclosed report highlights some of our preliminary findings on curriculum and instruction.

During the coming year we will be collating these data and others and writing separate reports on agriculture and natural resources, biological sciences, engineering sciences and technologies, mathematics and computer sciences, chemistry, earth and space sciences, physics, interdisciplinary natural sciences, psychology, sociology, economics, and interdisciplinary social sciences. In order to make our literature reviews as comprehensive as possible, we are requesting that you send us any articles, reports, or raw data that concern two-year college education in any of these disciplines.

Thank you for your consideration.

Cordially,

Arthur M. Cohen
Principal Investigator

William T. Mooney, Jr.
Staff Associate

UNIVERSITY OF CALIF.
LOS ANGELES

APR 13 1979

CLEARINGHOUSE FOR
JUNIOR COLLEGES

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